ISO and CAN Steerable Hitch Installation & Operation Manual

P/N 016-4001-106 Rev. F 04/17 E29484

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CHAPTER 1 IMPORTANT SAFETY INFORMATION

NOTICE

Read this manual and the operation and safety instructions included with your implement and/or controller carefully before installing the Steerable Hitch system.

- Follow all safety information presented within this manual.
- If you require assistance with any portion of the installation or service of your Raven equipment, contact Raven or Unverferth for support.
- Follow all safety labels affixed to the Steerable Hitch system components. Be sure to keep safety labels in good condition and replace any missing or damaged labels. To obtain replacements for missing or damaged safety labels, contact your local Raven dealer.

When operating the machine after installing the Steerable Hitch system, observe the following safety measures:

- Be alert and aware of surroundings.
- Do not operate the Steerable Hitch system or any agricultural equipment while under the influence of alcohol or an illegal substance.
- Remain in the operator's position in the machine at all times when the Steerable Hitch system is engaged.
- Disable the Steerable Hitch system when exiting the operator's seat and machine.
- Do not drive the machine with the Steerable Hitch system enabled on any public road.
- Determine and remain a safe working distance from other individuals. The operator is responsible for disabling the Steerable Hitch system when the safe working distance has diminished.
- Ensure the Steerable Hitch system is disabled prior to starting any maintenance work on the Steerable Hitch system or the machine.

⚠ WARNING

- Before starting the hydraulic installation, bleed the pressure from the hydraulic system.
- When starting the machine for the first time after installing the Steerable Hitch system, be sure that all persons stand clear in case a hose has not been properly tightened.
- When operating the system, ensure people and obstacles are clear of the hitch pivot points and unfolded boom components.

⚠ CAUTION

HYDRAULIC SAFETY

- Raven Industries recommends that appropriate protective equipment be worn at all times when working on the hydraulic system.
- Never attempt to work on a hydraulic system with the equipment running. Care should always be taken when opening a system that has been previously pressurized.
- When disconnecting the hydraulic hoses or purging is required, be aware that the hydraulic fluid may be extremely hot and under high pressure. Caution must be exercised.
- Any work performed on the hydraulic system must be done in accordance with the machine manufacturer's approved maintenance instructions.
- When installing hydraulics or performing diagnostics, maintenance, or routine service, ensure that precautions are taken to prevent any foreign material or contaminants from being introduced into the machine's hydraulic system. Objects or materials that are able to bypass the machine's hydraulic filtration system will reduce performance and possible damage the Steerable Hitch valve.

ELECTRICAL SAFETY

- Always verify that the power leads are connected to the correct polarity as marked. Reversing the power leads could cause severe damage to the equipment.
- Ensure that the power cable is the last cable to be connected.

CHAPTER 2 INTRODUCTION

Congratulations on your purchase of the Steerable Hitch system! The Steerable Hitch system is designed to actively steer the sprayer's hitch in response to various driving conditions such as speed, turning rate, and field terrain. The Steerable Hitch system is connected to the Raven CAN bus to allow for user interface control via Raven consoles.

PREPARING FOR INSTALLATION

Before installing the Steerable Hitch system, park the machine where the ground is level, clean, and dry. Bleed pressure from the hydraulic system and leave the machine turned off for the duration of the installation process.

During the installation process, follow good safety practices. Be sure to carefully read the instructions in this manual as you complete the installation process.

RECOMMENDATIONS

Raven Industries recommends the following best practices when installing or operating the Steerable Hitch system for the first time, at the start of the season, or when moving the Steerable Hitch system to another machine:

- Ensure the machine's hydraulic filters have been recently changed and there are no issues with the machine's hydraulic system (e.g., pump issues, faulty hydraulic motors, fine metal deposits in the hydraulic hoses, etc.).
- Ensure the machine's hydraulic valve is using fresh oil and debris is flushed from the hydraulic hoses, valves, and filters.

Raven Industries recommends the following best practices when installing the Steerable Hitch system:

- Use part numbers to identify the parts.
- Do not remove the plastic wrap from a part until it is necessary for installation.
- Do not remove plastic caps from a part until it is necessary for installation.

POINT OF REFERENCE

The instructions in this manual assume that you are standing behind the machine, looking toward the cab.

TOOLS NEEDED

The following tools are recommended for installation of the Steerable Hitch system:

- SAE standard-sized wrenches
- Cable ties
- Set of tools

- Side cutters

HYDRAULIC FITTINGS

This manual may reference the following types of hydraulic fittings:

- SAE O-ring fittings
- ORFS (O-Ring Face Seal) fittings
- JIC fittings

UPDATES

Software and manual updates are available on the Raven Applied Technology website:

http://www.ravenhelp.com

At Raven Industries, we strive to make your experience with our products as rewarding as possible. One way to improve this experience is to provide us with feedback on this manual.

Your feedback will help shape the future of our product documentation and the overall service we provide. We appreciate the opportunity to see ourselves as our customers see us and are eager to gather ideas on how we have been helping or how we can do better.

To serve you best, please send an email with the following information to

techwriting@ravenind.com

-ISO and CAN Steerable Hitch Installation & Operation Manual
-P/N 016-4001-106 Rev. F
-Any comments or feedback (include chapter or page numbers if applicable).
-Let us know how long have you been using this or other Raven products.

We will not share your email or any information you provide with anyone else. Your feedback is valued and extremely important to us.

Thank you for your time.

KIT CONTENTS

This section contains a list of the components that are included in the Steerable Hitch kit. Before beginning the system installation, compare the items in the Steerable Hitch kit with the components on this list.

ISO INSTALLATION KIT

TABLE 1. ISO Installation Kit (P/N 117-4001-122)

Picture	Item Description	Part Number	Qty.	UM #
Not Pictured	Manual - Steerable Hitch Installation & Operation	016-4001-106	1	9005924
	Valve - Open Center Hydraulic	063-0131-130	1	9005925
	Node - Steerable Hitch	063-0173-445	1	9006470
	Cable - 6' ISO Implement Tee	115-0171-961	1	9006539
	Cable - Unverferth ISO Steerable Hitch	115-4001-189	1	9006538
	Assembly - Non-Contact Rotary Sensor	063-0181-026	1	9006222
	Sensor - Inductive Proximity	412-6000-007	1	9005932

CAN INSTALLATION KIT

TABLE 2. CAN Installation Kit (P/N 117-4001-124)

Picture	Item Description	Part Number	Qty.	UM #
Not Pictured	Manual - Steerable Hitch Installation & Operation	016-4001-106	1	9005924
Not Pictured	Installation Sheet - Remote Implement Proximity Switch	016-0171-374	1	N/A

TABLE 2. CAN Installation Kit (P/N 117-4001-124)

Picture	Item Description	Part Number	Qty.	UM #
	Valve - Open Center Hydraulic	063-0131-130	1	9005925
	Node - Steerable Hitch	063-0173-261	1	9005926
	Cable - 12′ Tee Adapter	115-0171-916	1	9006292
	Cable - 12′ Tee Speed Adapter	115-0171-977	1	9005927
	Cable - Unverferth Steerable Hitch	115-4001-189	1	9006538
	Assembly - Non-Contact Rotary Sensor	063-0181-026	1	9006222
	Sensor - Inductive Proximity	412-6000-007	1	9005932

GEN III INSTALLATION KIT

NOTE: The CAN node (063-0173-261) or ISO node (P/N 063-0173-445) is sold separately. Contact your local Raven dealer for ordering information.

TABLE 3. Gen III Installation Kit (P/N 117-4001-130)

Picture	Item Description	Part Number	Qty.	UM #
Not Pictured	Manual - Steerable Hitch Installation & Operation	016-4001-106	1	9005924
	Valve - Open Center Hydraulic	063-0131-130	1	9005925

TABLE 3. Gen III Installation Kit (P/N 117-4001-130)

Picture	Item Description	Part Number	Qty.	UM #
	Cable - ISO Steerable Hitch Node Harness	115-7302-004	1	9006710
	Assembly - Non-Contact Rotary Sensor	063-0181-026	1	9006222
	Sensor - Inductive Proximity	412-6000-007	1	9005932

UNVERFERTH INSTALLATION KIT

TABLE 4. Unverferth Installation Kit (P/N 407791FS)

Item Description	Part Number	Qty.
Bracket - Rotary Sensor	408092B	1
Assembly - Lock	4077958	1
Fitting - 9/16" SAE O-Ring (M) to 9/16" JIC Flare-O (M) Adapter	9006150	2
Plate - Hose Clamp Top	9003814	2
Clamp Pair - 1/4" Hose	9003816	1
Clamp Pair - 3/8" Hose	9004367	1
Filter - Pressure	9005403	1
Cylinder - 3-1/2" x 12"	9005673	1
Fitting - 7/8" SAE O-Ring (M) x 3/4" JIC Flare-O (M) Straight Run Tee	9006174	1
Hose - 1/4" x 66"	9005864	2
Hose - 3/8" x 156"	9005869	2
Hose Marker - Steering Pressure	9005870	1
Hose Marker - Steering Return	9005871	1
Screw - #8-32 x 1/2" Washer Head HCS	9006042	2
Nut - M10 x 1.0" Jam	9005874	1
Bolt - 5/16"-18 x 3/4" HC5 Serrated Flange	91256	6
Nut - 5/16"-18 Serrated Flange	91257	6
Coupling - Male Tip	91383	2
Fitting - 7/8" SAE O-Ring (M) to 3/4" JIC Flare-O (M) 90° Elbow	9006175	1

TABLE 4. Unverferth Installation Kit (P/N 407791FS)

Item Description	Part Number	Qty.
Fitting - 7/8" SAE O-Ring (M) to 3/4" JIC Flare-O (M) Adapter	9006176	1
Bolt - 5/16"-18 x 2" HC5	9390-034	2
Bolt - 3/8"-16 x 1-1/4" HC5	9390-056	3
Fitting - 3/4" SAE O-Ring Nipple Adapter	98508	1
Fitting - 3/4" SAE O-Ring (M) to 9/16" JIC Flare-O (M) 90° Elbow	9006173	2
Nut - 3/8"-16 Zinc Flanged Lock	9928	3
Hose - 3/8" x 15"	9001228	1
Bracket - Proximity Switch	407906B	1
U-Bolt - 120'/132' Proximity Switch Bracket	9004454	1
U-Bolt - 80'/100' Proximity Switch Bracket	9005281	1
Nut - #8-32 Serrated Flange	9006041	2
Valve - In-Line Check	94909	1
Nut - 1/4"-20 Serrated Flange	97189	2

CHAPTER 3 STEERABLE HITCH COMPONENT INSTALLATION

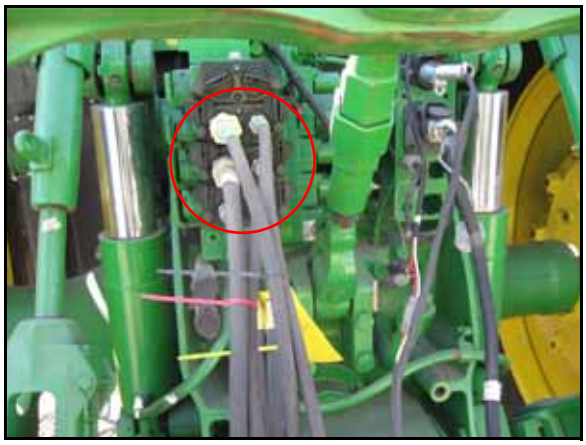
INSTALL THE HYDRAULIC SYSTEM

FIGURE 1. Hydraulic Valve Installed

1. Mount the Steerable Hitch hydraulic valve (P/N 063-0131-130) to the machine's left frame rail, below the rinse tank.

NOTE: Model year 2011 and newer machines have steering valve bolt patterns drilled into the frame rail. If the machine is an older model, use the holes in the Steerable Hitch hydraulic valve as a template to drill holes in the frame rail.

FIGURE 2. Machine's Selective Control Valve



2. Install a hydraulic hose in the pressure port of the machine's selective control valve.

3. Route the new pressure hose from the machine's selective control valve and connect it to Port P of the Steerable Hitch valve.
4. Install a hydraulic hose in the tank port of the machine's selective control valve.

FIGURE 3. Tank Hose Installed

5. Install a tee fitting in Port T of the Steerable Hitch valve.
6. Connect the new tank hose to one end of the installed tee fitting in Port T of the Steerable Hitch valve.
7. Install a hydraulic hose on the remaining end of the installed tee fitting in Port T of the Steerable Hitch valve.
8. Connect the other end of the installed hydraulic hose to Port EF of the Steerable Hitch valve.

FIGURE 4. Left and Right Steering Hoses Installed

9. Install a hydraulic hose on the open port in the rod-end of the machine's hitch cylinder.
10. Connect the other end of the installed hydraulic hose to the Steerable Hitch valve.

- If the hitch cylinder is installed on the left side of the tongue, connect the hose to Port B.
- If the hitch cylinder is installed on the right side of the tongue, connect the hose to Port A.

11. Install a hydraulic hose on the open port in the base-end of the machine's hitch cylinder.
12. Connect the other end of the installed hydraulic hose to the Steerable Hitch valve.

- If the hitch cylinder is installed on the left side of the tongue, connect the hose to Port A.
- If the hitch cylinder is installed on the right side of the tongue, connect the hose to Port B.

FIGURE 5. Hydraulic Schematic - Cylinder on Left Side of Tongue

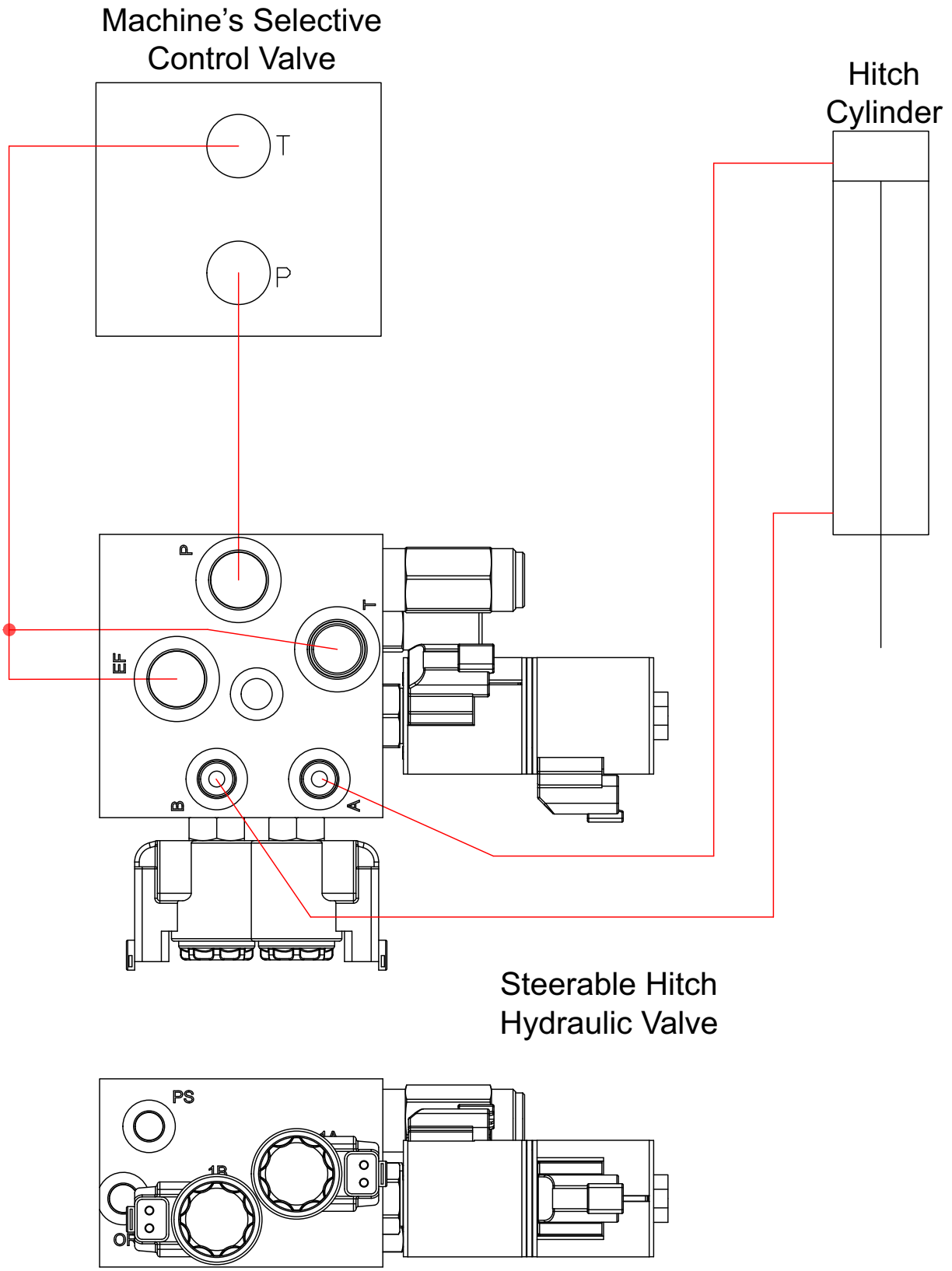
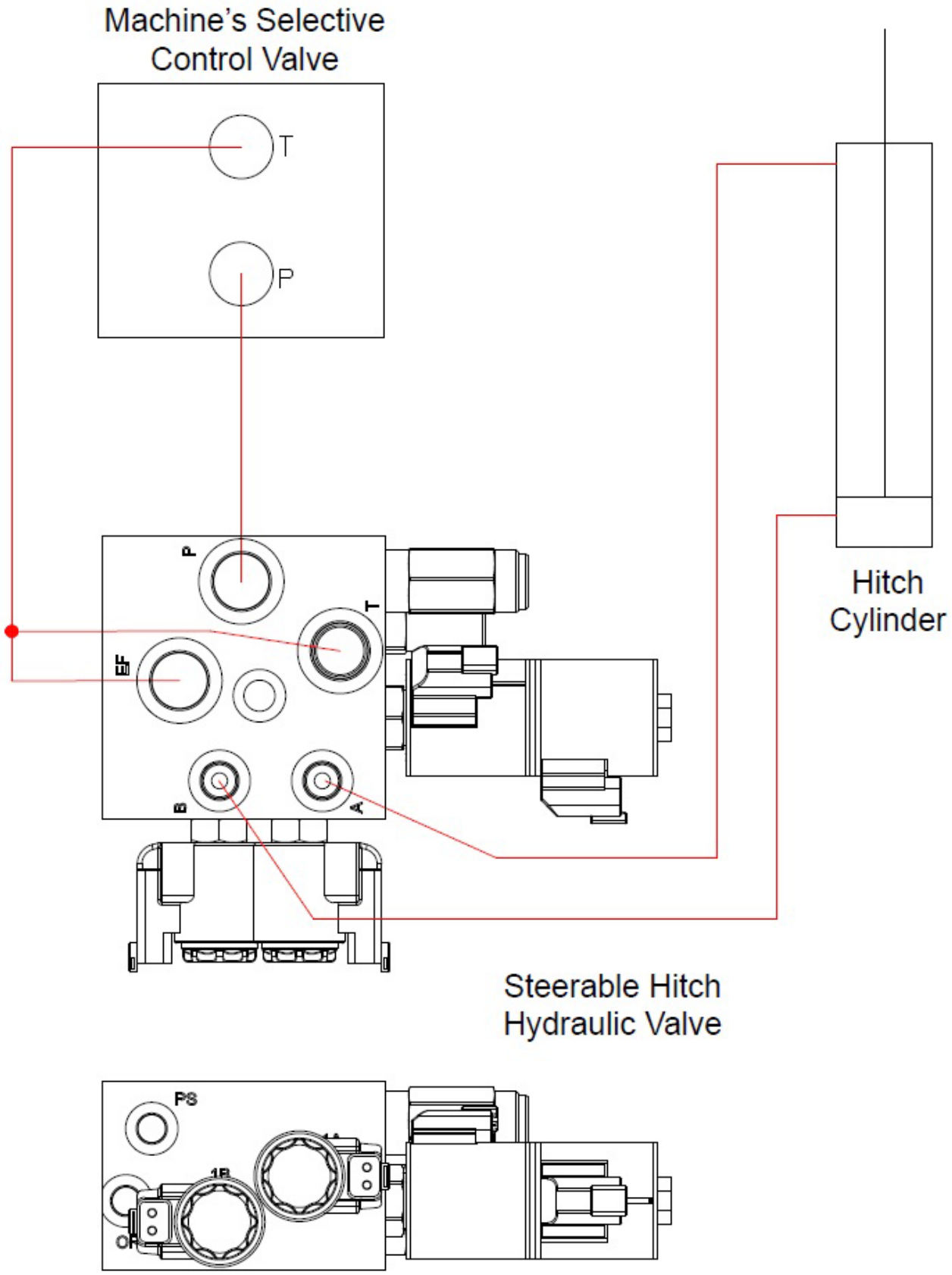


FIGURE 6. Hydraulic Schematic -Cylinder on Right Side of Tongue



INSTALL THE STEERABLE HITCH NODE

FIGURE 7. Steerable Hitch Node Installed

Mount the Steerable Hitch node (CAN P/N 063-0173-261, ISO P/N 063-0173-445) to the bottom of the catwalk using three 3/8"-16 UNC x 1-1/4" hex bolts, three 3/8" flat washers, and three 3/8"-16 zinc flanged lock nuts.

NOTE: Holes are pre-drilled on machines model year 2011 and newer. Older model machines will require the holes to be drilled.

NOTE: Position the node so that the cable connectors face the center of the machine and the glass faces down.

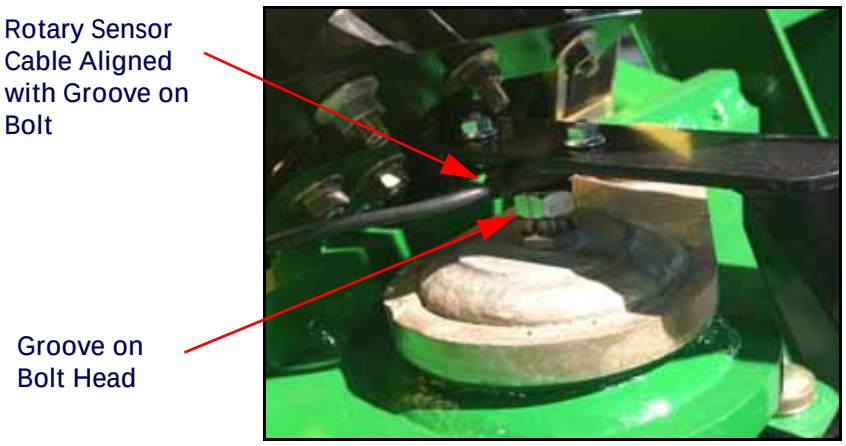
INSTALL THE ROTARY SENSOR

FIGURE 8. Rotary Sensor Installed

1. Position the hitch so that it is in the straight position.
2. Install the hitch locking mechanism.
3. Thread the M10 jam nut included in the rotary sensor installation kit onto the magnetic bolt of the rotary sensor (P/N 063-0181-026).
4. Screw the magnetic bolt into the machine's pivot pin.

5. Mount the rotary sensor assembly on the sensor bracket using the supplied hardware.
6. Mount the sensor bracket on the sprayer's tongue using the supplied hardware.

FIGURE 9. Rotary Sensor Alignment



7. Align the groove on the bolt head to the cable coming out of the sensor.

IMPORTANT: The sensor must be aligned so the output is near zero when the hitch is centered. This is critical to keep the left and right moveable range the same.

8. Position the rotary sensor assembly components so that the gap between the sensor and the magnetic bolt is approximately 1/16".
9. Using the plastic tool that was included in the sensor installation kit, verify that the sensor is centered above the bolt head.
10. Tighten the nuts to ensure the sensor is mounted securely.

INSTALL THE PROXIMITY SWITCH

FIGURE 10. Proximity Switch Installed (Near Right Wing Folding Joint on Center Section of the Sprayer)

1. Install the proximity switch (P/N 412-6000-007) on the switch mounting bracket using the supplied hardware.
2. Mount the switch mounting bracket on the machine's center section as shown in Figure 10.
3. Position the proximity switch so that it is located within 1/4" of metal when the machine's booms are unfolded and no metal is near the sensor surface when the booms are folded.

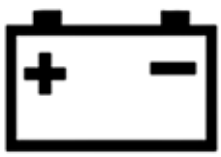
CHAPTER 4 CAN INSTALLATION

These instructions are designed to assist in the installation of the CAN Steerable Hitch system.

INSTALL THE CONTROL CONSOLE

Refer to the manual of the Raven control console being used to control the Steerable Hitch system.

VERIFY CONTROL CONSOLE INSTALLATION



⚠ CAUTION

Do not connect the power and ground leads to the vehicle's starter.

Be sure to verify that the machine is turned off before connecting the power and ground leads to a 12 volt battery.

Do not secure the power leads to existing battery cables or other wiring.

Refer to the Operator's manual of the Raven control console being used to control the Steerable Hitch system.

STEERABLE HITCH MINI-CONSOLE

1. Power on the Steerable Hitch mini-console.
2. Verify the Steerable Hitch Menu appears.

NOTE: If the Steerable Hitch Menu does not appear, verify power and CAN connections to the Steerable Hitch node.

SCS CONSOLES

1. Power on the SCS 4000 series console.
2. Verify that "HITCH" appears in one of the product columns.

NOTE: If "HITCH" does not appear in the product columns, verify power and CAN connections to the Steerable Hitch node.

ENVIZIO PRO CONSOLE

1. Power on the Envizio Pro console.
2. Verify that the Steerable Hitch icon appears on the Envizio Pro Menu.

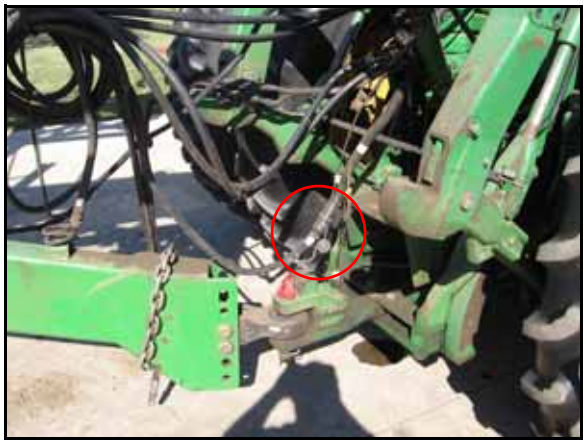
NOTE: If the Steerable Hitch icon does not appear, verify power and CAN connections to the Steerable Hitch node.

INSTALL THE STEERABLE HITCH WIRING

CAN INSTALLATION KIT (P/N 117-4001-124)

NOTE: In addition to the steps below, refer to the system drawings at the end of this chapter for further details.

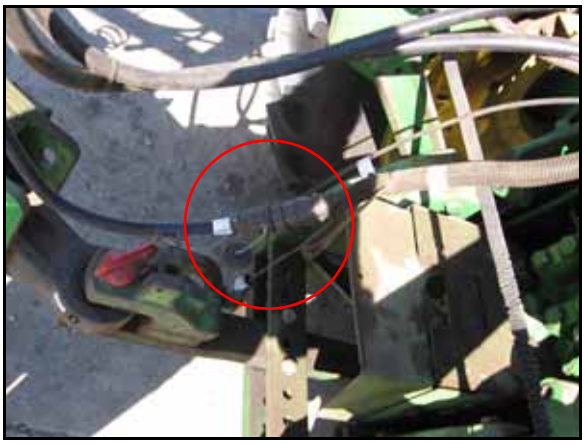
FIGURE 1. Steerable Hitch Harness Cable Installed



1. Route the SCS 4400 console cable or the machine's chassis cable from the hitch of the tractor to the battery and connect the terminals.

NOTE: The SCS console cable (P/N 115-0172-007) and/or the machine's chassis cable is sold separately from the Steerable Hitch kit.

FIGURE 2. Power Connection



2. Connect the large, round connector on the Steerable Hitch harness cable (P/N 115-4001-189) to the 12' tee adapter cable (P/N 115-0171-916).
3. Connect one end of the 12' tee adapter cable to the SCS 4400 console cable or machine's chassis cable located near the hitch of the tractor.
4. Verify that a CAN terminator (P/N 063-0173-224) is installed on the remaining end of the 12' tee adapter cable.

NOTE: Additional tee adapter cables may be installed on this end as needed to support Raven CAN products (e.g., product control, AutoBoom, etc.).

5. Connect the SPS connector on the Steerable Hitch harness cable to the rotary sensor on the king pin located in front of the rinse tank.
6. Route the valve connections along the hoses under the rinse tank toward the Steerable Hitch valve.
7. Connect the LEFT/OUTER connection of the Steerable Hitch harness cable to the top coil of the stack on the Steerable Hitch valve.
8. Connect the RIGHT/INNER connection to the bottom coil of the stack on the Steerable Hitch valve.
9. Connect the remaining unlabeled cable connections to Port 1A and 1B of the Steerable Hitch valve.
10. Route the ENABLE connector back to the right wing fold out/in cylinder and connect it to the installed proximity switch.

FIGURE 3. Steerable Hitch Harness Connected to Node

11. Connect the large, rectangular node connectors of the Steerable Hitch harness cable into the correct ports of the Steerable Hitch node (P/N 063-0173-261), tightening the bolts to secure the connections.
12. Verify that the other CAN terminator (P/N 063-0173-369) is installed on the console cable near the controller.

GEN III INSTALLATION KIT (P/N 117-4001-130)

1. Route the SCS 4400 console cable or the machine's chassis harness cable from the hitch of the tractor to the battery and connect the terminals.

NOTE: The SCS console cable (P/N 115-0172-215) and/or the machine's chassis cable is sold separately from the Steerable Hitch kit.

2. Connect the sprayer's power harness to the SCS console cable or the chassis cable.

NOTE: The power harness (P/N 115-7302-001) should already be installed on the sprayer and is not included in the Steerable Hitch kit.

3. Disconnect the sprayer's power harness from the sprayer's chassis harness.

NOTE: The sprayer's chassis harness (P/N 115-7302-005) should already be installed on the sprayer and is not included in the Steerable Hitch kit.

4. Connect the Steerable Hitch harness (P/N 115-7302-004) between the sprayer's power harness and the chassis harness.
5. Connect the large, rectangular connectors of the Steerable Hitch harness into the correct ports of the Steerable Hitch node (P/N 063-0173-261), tightening the bolts to secure the connectors.
6. Connect the WIRELESS RECEIVER connection on the Steerable Hitch harness to the mating connector on the sprayer's receiver cable.
7. Connect the SPS connector on the Steerable Hitch harness cable to the rotary sensor on the king pin located in front of the rinse tank.
8. Route the valve connections along the hoses under the rinse tank toward the Steerable Hitch valve.
9. Connect the LEFT/OUTER connection of the Steerable Hitch harness cable to the top coil of the stack on the Steerable Hitch valve.
10. Connect the RIGHT/INNER connection to the bottom coil of the stack on the Steerable Hitch valve.
11. Connect the remaining unlabeled cable connections to Port 1A and 1B of the Steerable Hitch valve.
12. Route the ENABLE connector back to the right wing fold out/in cylinder and connect it to the installed proximity switch.

INSTALL THE SPEED SENSOR

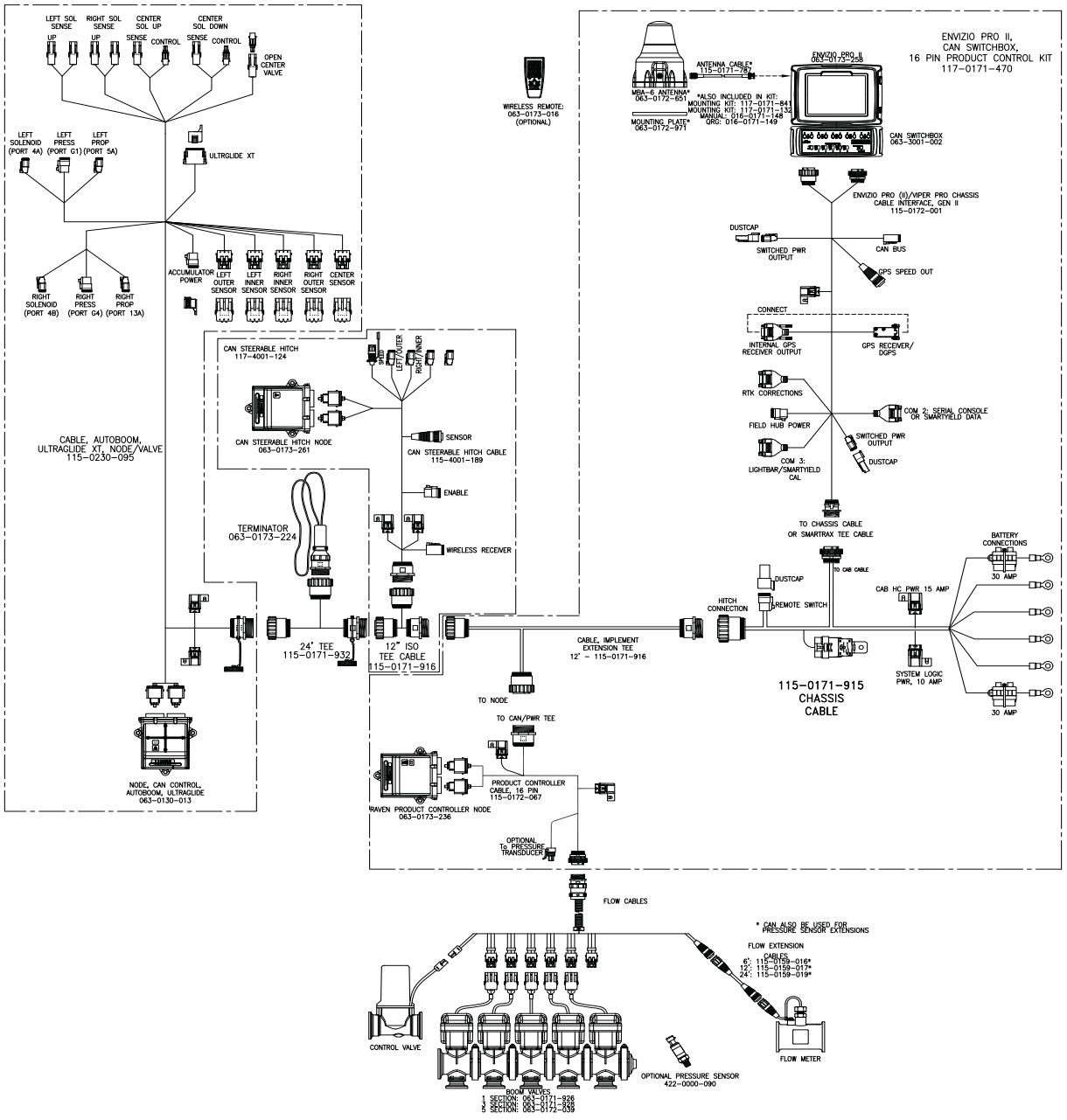
1. Mount the Garmin Astro II GPS receiver or alternate speed source to the top of the tractor cab.

FIGURE 4. Speed Sensor Connection

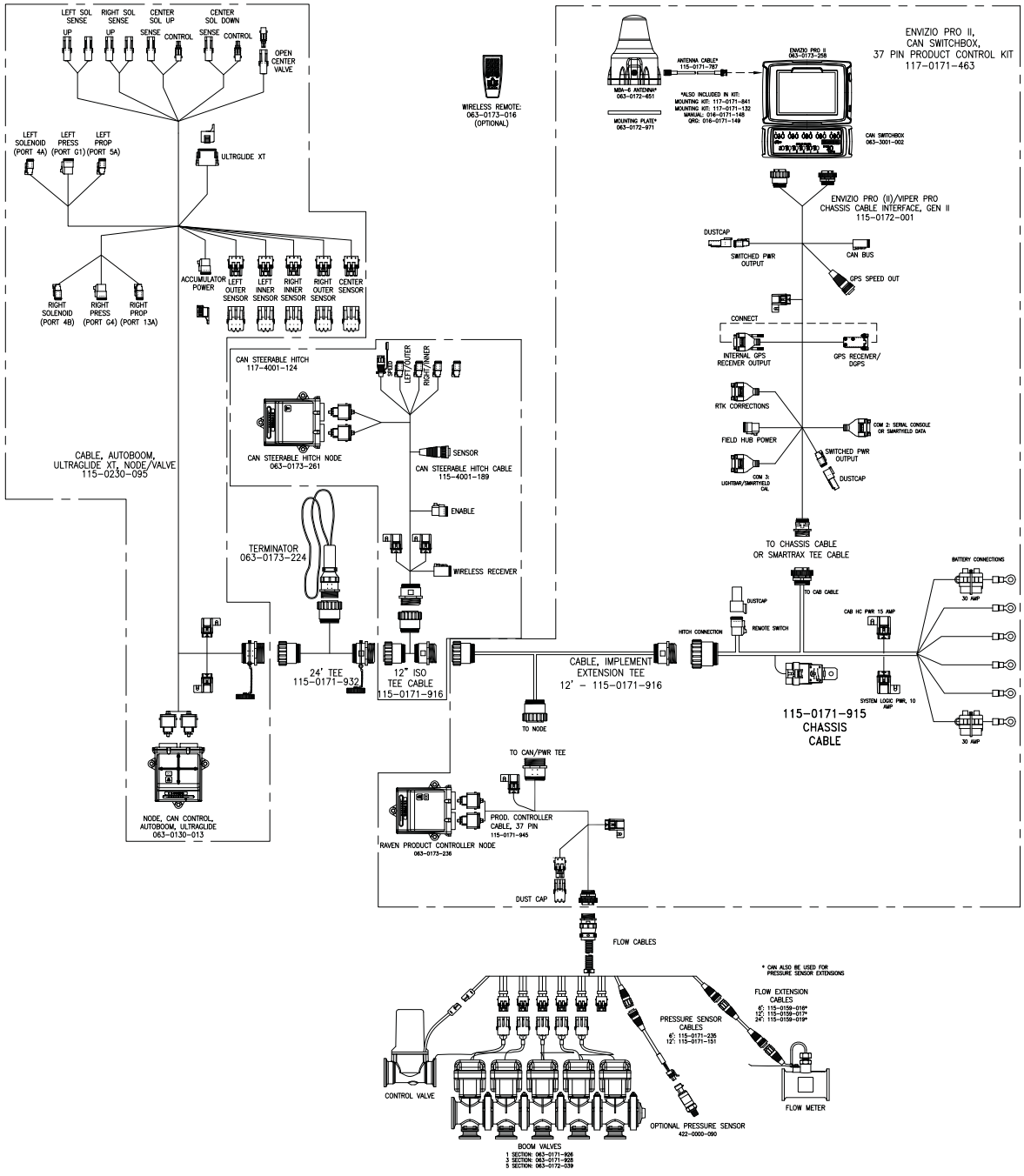
2. Connect the speed source to the Steerable Hitch harness cable (P/N 115-4001-189 or 115-7302-004) using the 12' speed adapter cable (P/N 115-0171-977)
3. Connect the remaining end of the speed adapter into the rate control harness cable, if available.

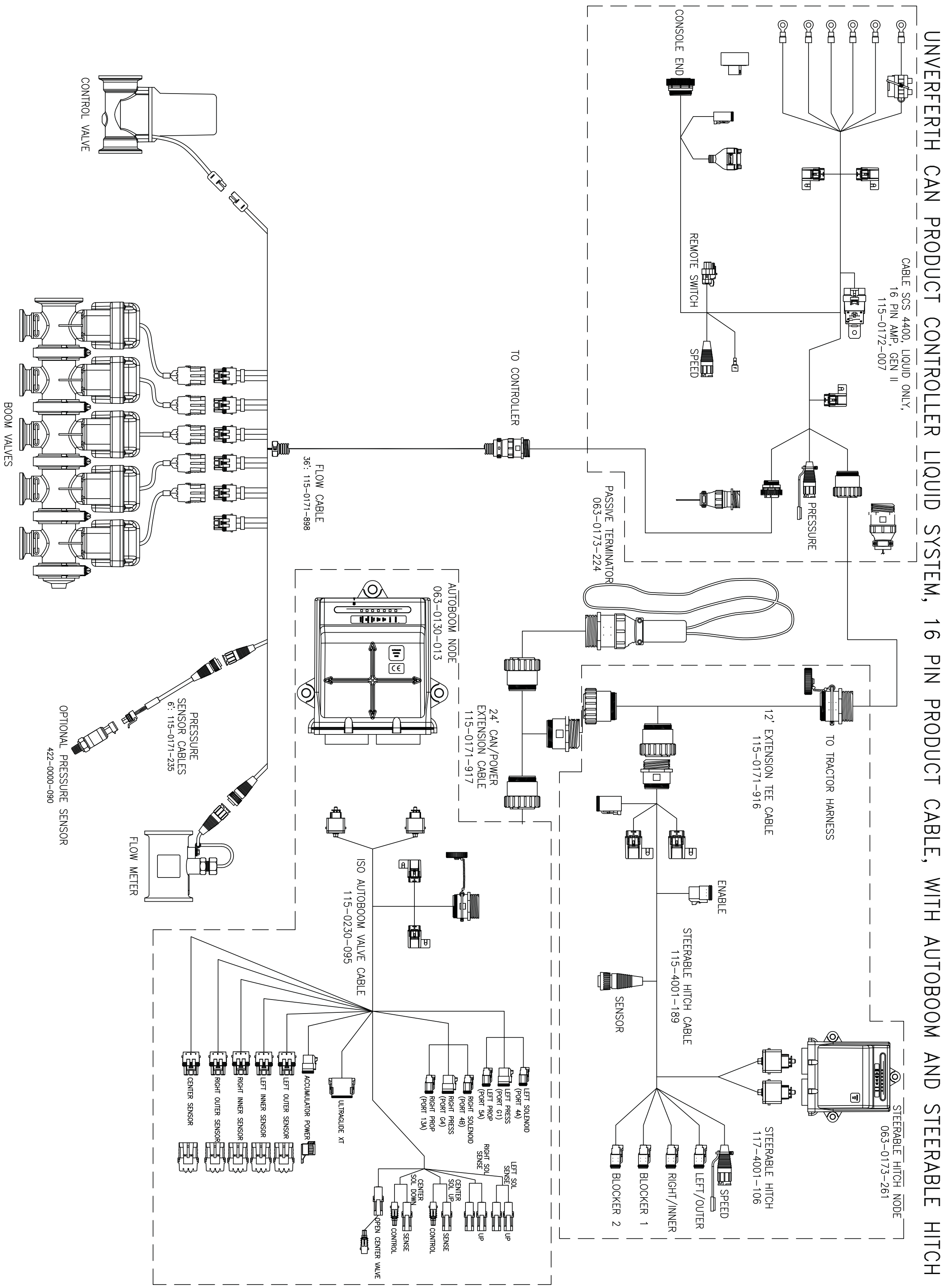
SYSTEM DIAGRAMS

ENVIZIO PRO II, CAN SWITCHBOX,
PRODUCT CONTROLLER LIQUID SYSTEM
16 PIN PRODUCT CABLE WITH STEERABLE HITCH, UNVERFERTH



ENVIZIO PRO II, CAN SWITCHBOX, PRODUCT CONTROLLER LIQUID SYSTEM 37 PIN PRODUCT CABLE & STEERABLE HITCH, UNVERFERTH




UNVERFERTH CAN PRODUCT CONTROLLER LIQUID SYSTEM, 16 PIN PRODUCT CABLE, WITH AUTOBOOM AND STEERABLE HITCH
CABLE SCS 4400, LIQUID ONLY, 16 PIN AMP, GEN II 115-0172-007
CONSOLE END
REMOTE SWITCH
SPEED
PRESSURE
PASSIVE TERMINATOR 063-0173-224
TO CONTROLLER
CONTROL VALVE
BOOM VALVES
FLOW CABLE 36' 115-0171-898
AUTOBOOM NODE 063-0130-013
24' CAN/POWER EXTENSION CABLE 115-0171-917
PRESSURE SENSOR CABLES 6' 115-0171-235
OPTIONAL PRESSURE SENSOR 422-0000-090
FLOW METER
TO TRACTOR HARNESS
12' EXTENSION TEE CABLE 115-0171-916
ENABLE
STEERABLE HITCH CABLE 115-4001-189
SENSOR
STEERABLE HITCH NODE 063-0173-261
STEERABLE HITCH 117-4001-106
SPEED
LEFT/OUTER
RIGHT/INNER
BLOCKER 1
BLOCKER 2
ISO AUTOBOOM VALVE CABLE 115-0230-095
LEFT SOLENOID (PORT 4A)
LEFT PRESS (PORT C1)
LEFT PROP (PORT 5A)
RIGHT SOLENOID (PORT 4B)
RIGHT PRESS (PORT G4)
RIGHT PROP (PORT 13A)
ULTRAGLIDE XT
ACCUMULATOR POWER
LEFT OUTER SENSOR
LEFT INNER SENSOR
RIGHT INNER SENSOR
RIGHT OUTER SENSOR
CENTER SENSOR
LEFT SOL SENSE
RIGHT SOL SENSE
CENTER SOL UP
CENTER SOL DOWN
UP
UP
SENSE
CONTROL
SENSE
CONTROL
OPEN CENTER VALVE

CHAPTER 5 ISO INSTALLATION

These instructions are designed to assist in the installation of the ISO Steerable Hitch system.

INSTALL THE STEERABLE HITCH WIRING

NOTE: In addition to the steps below, refer to the system drawings at the end of this chapter for further details.

ISO INSTALLATION KIT (P/N 117-4001-122)

FIGURE 1. Steerable Hitch Harness Connected to Hitch CAN Connector

1. Remove the terminator from the rate controller cable.
2. Connect the large, round connector on the Steerable Hitch harness cable (P/N 115-4001-189) to the 6' tee adapter cable (P/N 115-0171-961).
3. Connect one end of the 6' tee adapter cable to the rate controller cable.

NOTE: If the Steerable Hitch system is being connected to a John Deere rate controller, use a John Deere rate controller to Raven ISO adapter cable (P/N 115-0171-991) to achieve the connection.

FIGURE 2. Terminator Installed on Steerable Hitch Harness

4. Install the terminator removed step 1 on the remaining connector of the 6' tee adapter cable.

NOTE: Use an ISO adapter cable (P/N 115--0171-963) to connect the terminator to the 6' tee adapter cable.

5. Connect the SPS connector on the Steerable Hitch harness cable to the rotary sensor on the king pin located in front of the rinse tank.
6. Route the valve connections along the hoses under the rinse tank toward the Steerable Hitch valve.
7. Connect the LEFT/OUTER connection of the Steerable Hitch harness cable to the top coil of the stack on the Steerable Hitch valve.
8. Connect the RIGHT/INNER connection to the bottom coil of the stack on the Steerable Hitch valve.
9. Connect the remaining unlabeled cable connections to Port 1A and 1B of the Steerable Hitch valve.
10. Route the ENABLE connector back to the right wing fold out/in cylinder.

FIGURE 3. Steerable Hitch Harness Connected to Node

11. Connect the large, rectangular connectors of the Steerable Hitch harness into the correct ports of the Steerable Hitch node (P/N 063-0173-445), tightening the bolts to secure the connectors.

GEN III ISO INSTALLATION KIT (P/N 117-4001-130)

NOTE: This section applies to sprayers model year 2012 and newer.

NOTE: In addition to the steps below, refer to the system drawings at the end of this chapter for further details.

1. Locate and disconnect the sprayer's main power harness and the sprayer's chassis cable connection.

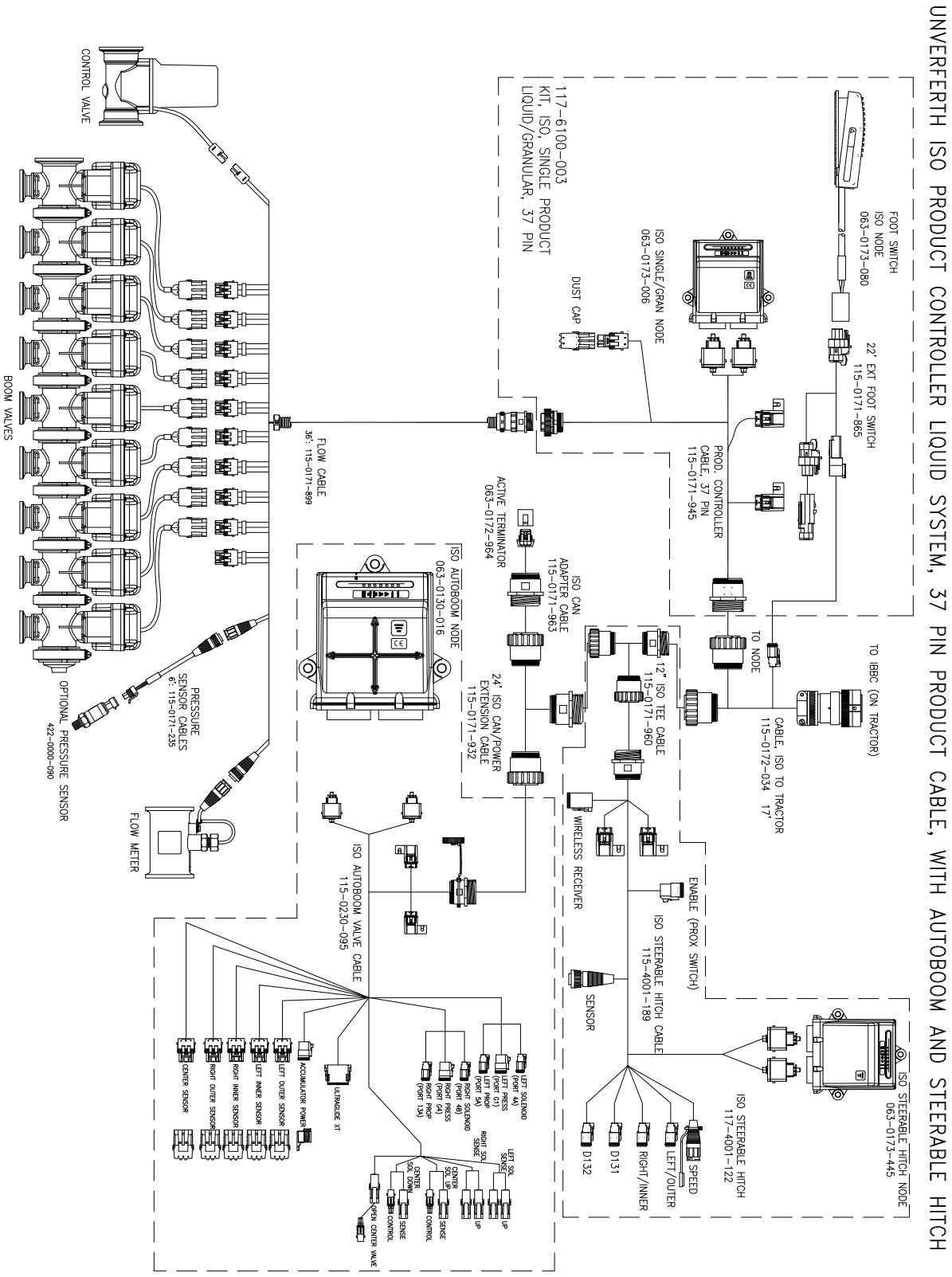
NOTE: The main power harness (P/N 115-7302-001) and chassis cable (P/N 115-7302-005) should already be installed on the sprayer and are not included in the Steerable Hitch kit.

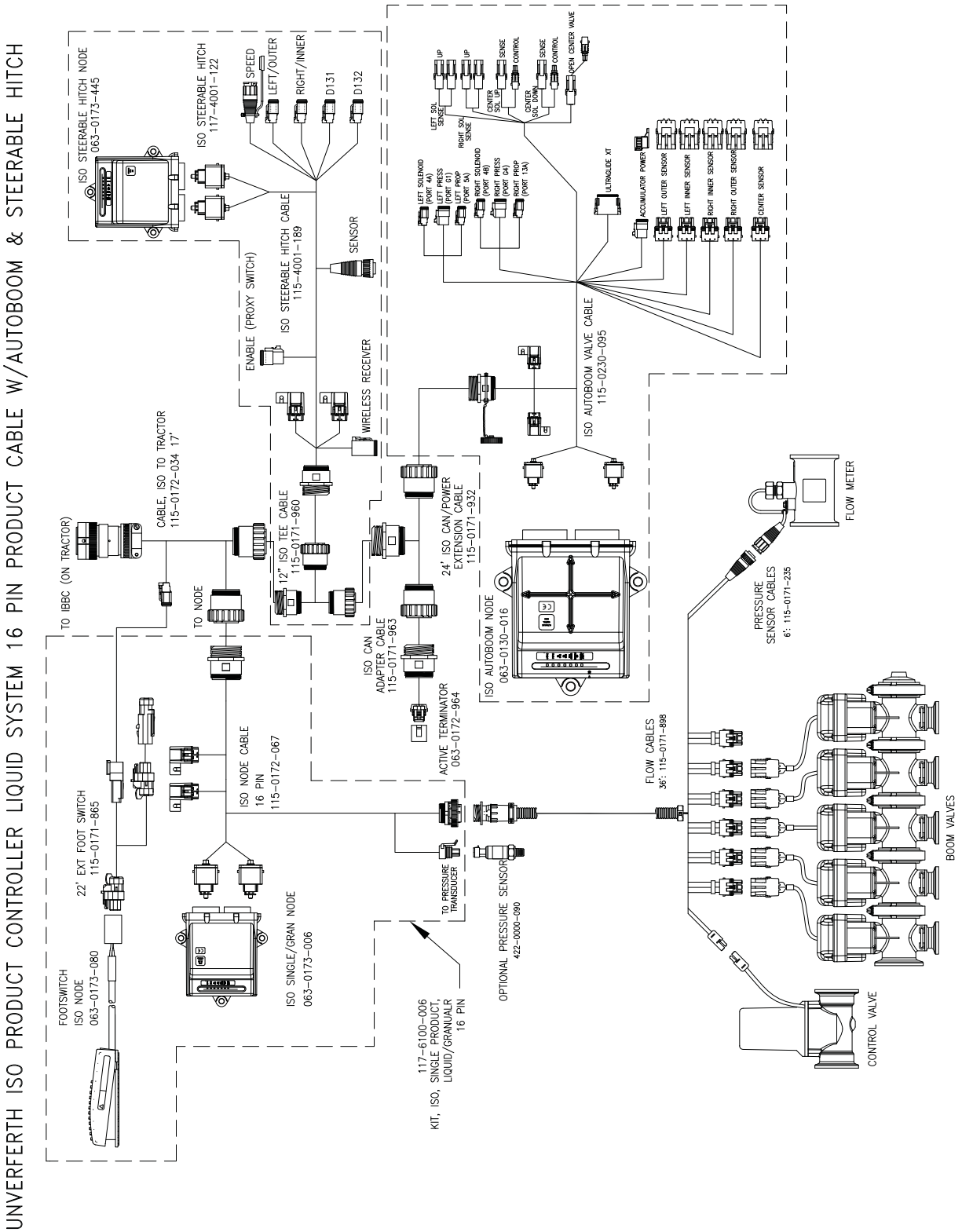
2. Install the Steerable Hitch harness (P/N 115-7302-004) between the sprayer's main power harness and chassis cable connection.

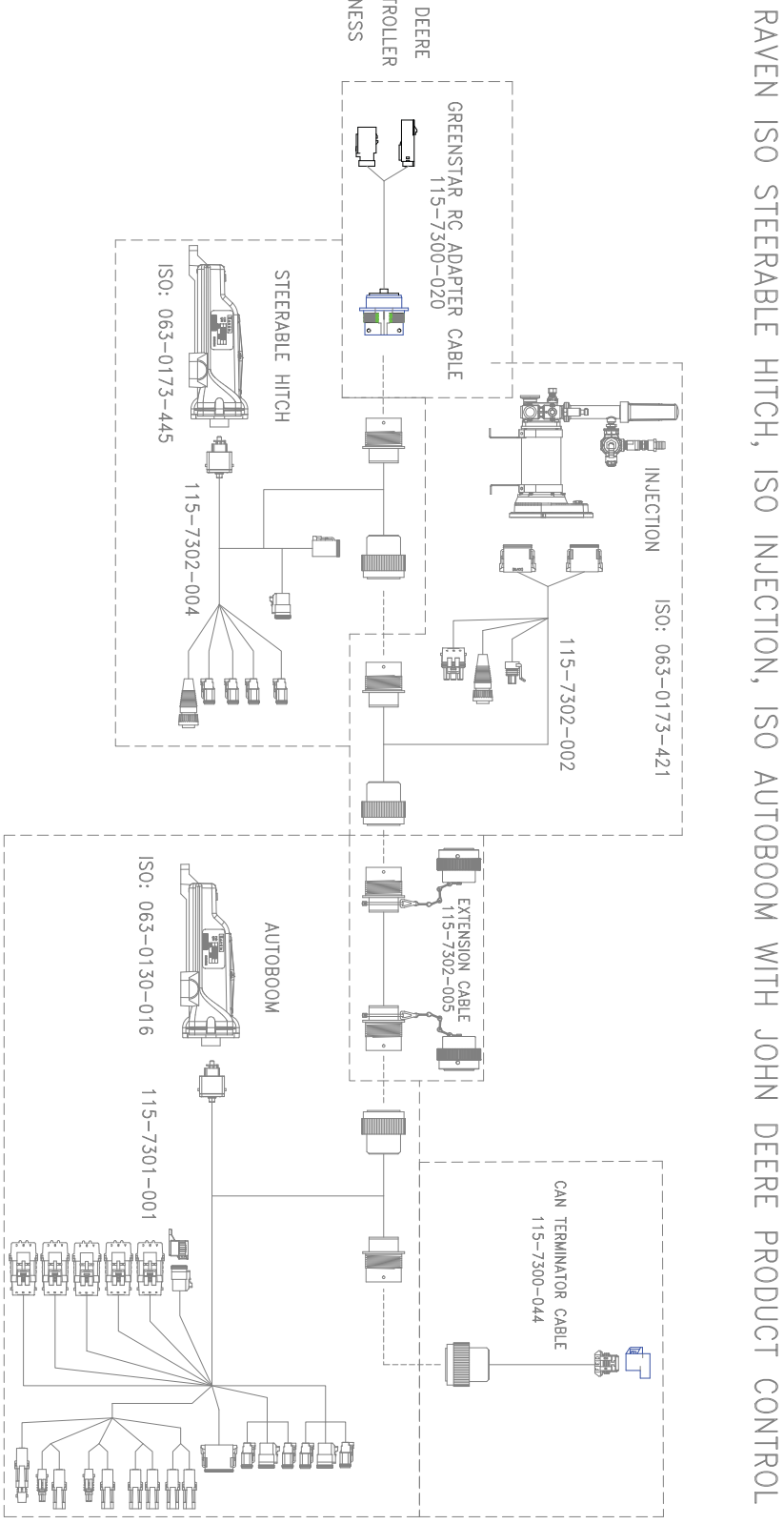
NOTE: If a John Deere rate controller is being used, Raven adapter cable P/N 115-7302-020 must be used to achieve the connection.

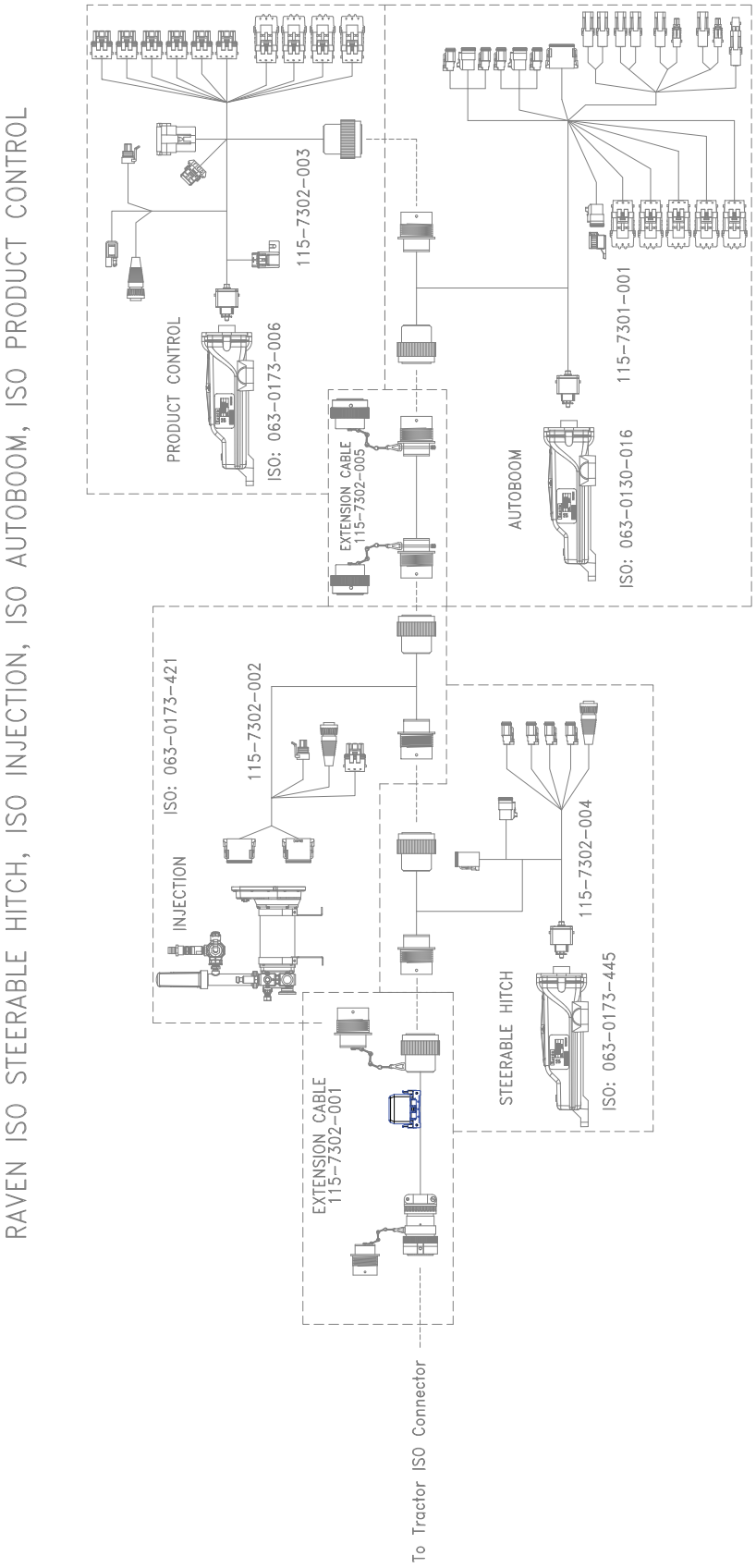
3. Connect the large, rectangular connectors of the Steerable Hitch harness into the correct ports of the Steerable Hitch node (P/N 063-0173-445), tightening the bolts to secure the connectors.
4. Connect the WIRELESS RECEIVER connection on the Steerable Hitch harness to the mating connector on the sprayer's receiver cable.
5. Connect the SPS connector on the Steerable Hitch harness cable to the rotary sensor on the king pin located in front of the rinse tank.
6. Route the valve connections along the hoses under the rinse tank toward the Steerable Hitch valve.
7. Connect the LEFT/OUTER connection of the Steerable Hitch harness cable to the top coil of the stack on the Steerable Hitch valve.
8. Connect the RIGHT/INNER connection to the bottom coil of the stack on the Steerable Hitch valve.
9. Connect the remaining unlabeled cable connections to Port 1A and 1B of the Steerable Hitch valve.
10. Route the ENABLE connector back to the right wing fold out/in cylinder and connect it to the installed proximity switch.

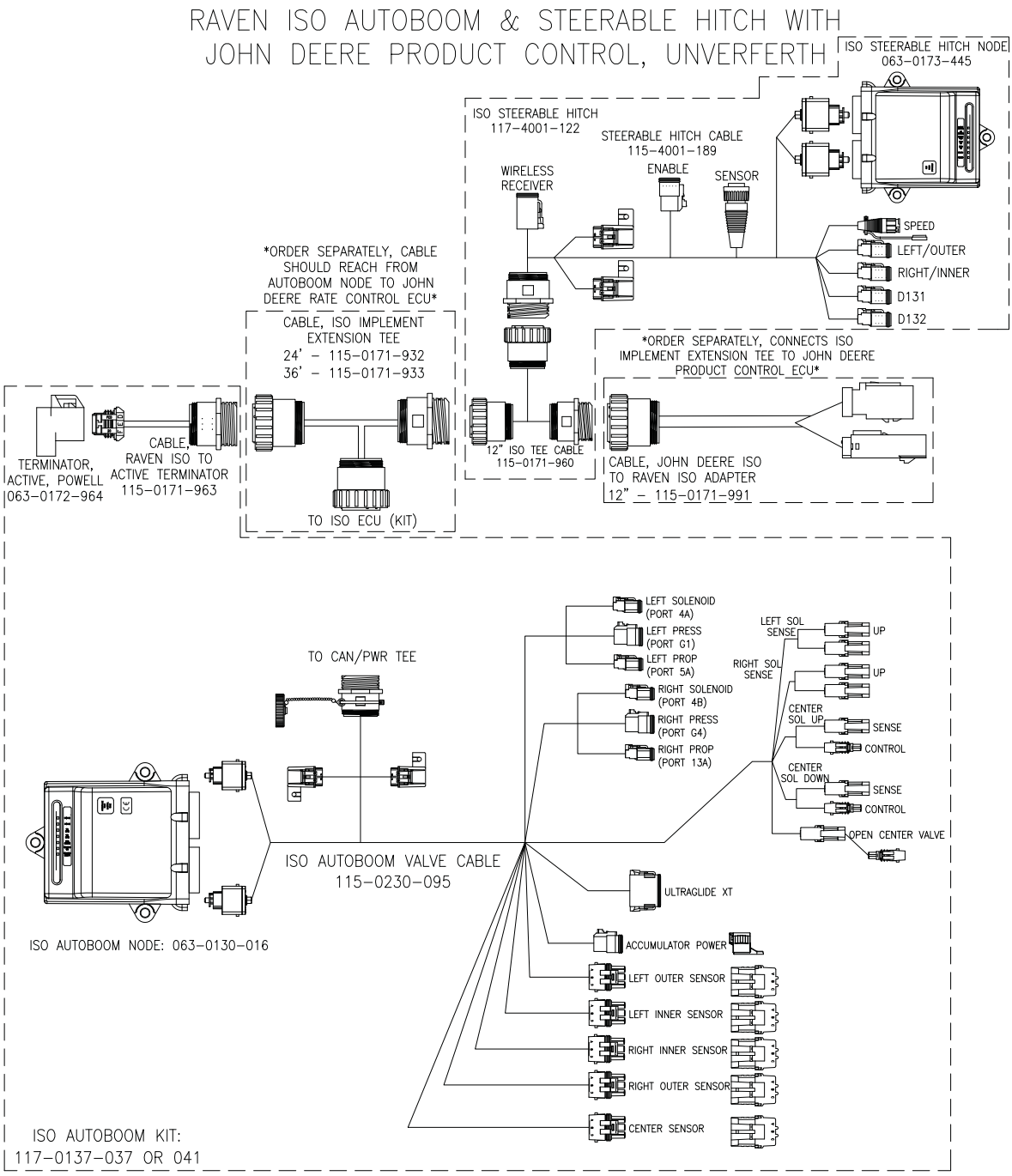
SYSTEM DIAGRAMS




UNVERFERTH ISO PRODUCT CONTROLLER LIQUID SYSTEM 16 PIN PRODUCT CABLE W/AUTOBOOM & STEERABLE HITCH
ISO STEERABLE HITCH NODE 063-0173-445
ISO STEERABLE HITCH 117-4001-122
SPEED
LEFT/OUTER
RIGHT/INNER
D131
D132
ISO STEERABLE HITCH CABLE 115-4001-189
SENSOR
ENABLE (PROXY SWITCH)
WIRELESS RECEIVER
TO IBBC (ON TRACTOR)
CABLE, ISO TO TRACTOR 115-0172-034 17'
TO NODE
12" ISO TEE CABLE 115-0171-960
24' ISO CAN/POWER EXTENSION CABLE 115-0171-932
ISO CAN ADAPTER CABLE 115-0171-963
ACTIVE TERMINATOR 063-0172-964
ISO AUTOBOOM NODE 063-0130-016
ISO AUTOBOOM VALVE CABLE 115-0230-095
ULTRAGLIDE XT
ACCUMULATOR POWER
LEFT OUTER SENSOR
LEFT INNER SENSOR
RIGHT INNER SENSOR
RIGHT OUTER SENSOR
CENTER SENSOR
LEFT SOLENOID (PORT 4A)
LEFT PRESS (PORT G1)
LEFT PROP (PORT 5A)
RIGHT SOLENOID (PORT 4B)
RIGHT PRESS (PORT G4)
RIGHT PROP (PORT 13A)
LEFT SOL SENSE
RIGHT SOL SENSE
CENTER SOL UP
CENTER SOL DOWN
UP
UP
SENSE
CONTROL
SENSE
CONTROL
OPEN CENTER VALVE
FLOW METER
PRESSURE SENSOR CABLES 6': 115-0171-235
FLOW CABLES 36': 115-0171-898
BOOM VALVES
CONTROL VALVE
ISO NODE CABLE 16 PIN 115-0172-067
22' EXT FOOT SWITCH 115-0171-865
FOOTSWITCH ISO NODE 063-0173-080
ISO SINGLE/GRAN NODE 063-0173-006
TO PRESSURE TRANSDUCER
OPTIONAL PRESSURE SENSOR 422-0000-090
117-6100-006 KIT, ISO, SINGLE PRODUCT; LIQUID/GRANUALR 16 PIN


RAVEN ISO STEERABLE HITCH, ISO INJECTION, ISO AUTOBOOM WITH JOHN DEERE PRODUCT CONTROL
TO JOHN DEERE RATE CONTROLLER HARNESS
GREENSTAR RC ADAPTER CABLE 115-7300-020
INJECTION
ISO: 063-0173-421
115-7302-002
STEERABLE HITCH
ISO: 063-0173-445
115-7302-004
EXTENSION CABLE 115-7302-005
AUTOBOOM
ISO: 063-0130-016
115-7301-001
CAN TERMINATOR CABLE 115-7300-044

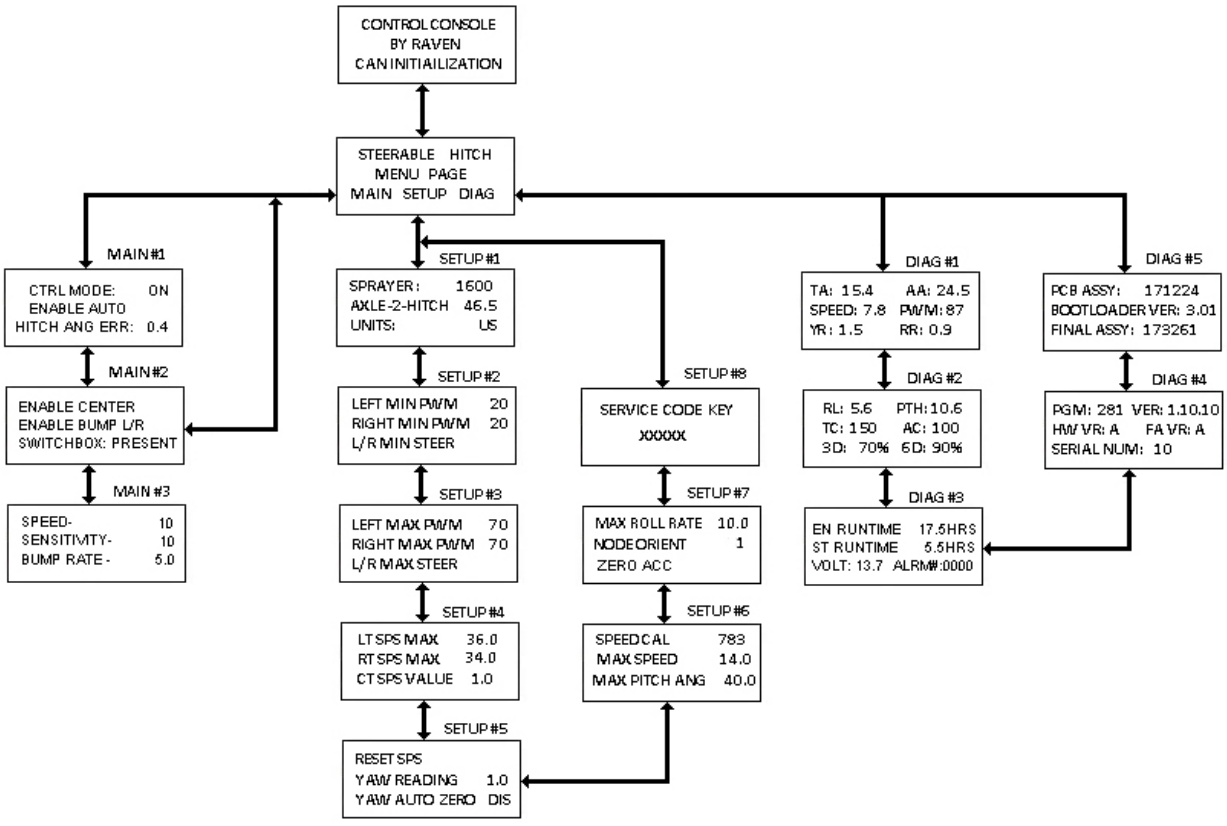

RAVEN ISO STEERABLE HITCH, ISO INJECTION, ISO AUTOBOOM, ISO PRODUCT CONTROL
PRODUCT CONTROL
ISO: 063-0173-006
115-7302-003
EXTENSION CABLE
115-7302-005
AUTOBOOM
ISO: 063-0130-016
115-7301-001
INJECTION
ISO: 063-0173-421
115-7302-002
STEERABLE HITCH
ISO: 063-0173-445
115-7302-004
EXTENSION CABLE
115-7302-001
To Tractor ISO Connector


RAVEN ISO AUTOBOOM & STEERABLE HITCH WITH
JOHN DEERE PRODUCT CONTROL, UNVERFERTH
ISO STEERABLE HITCH NODE
063-0173-445
ISO STEERABLE HITCH
117-4001-122
STEERABLE HITCH CABLE
115-4001-189
WIRELESS RECEIVER
ENABLE
SENSOR
SPEED
LEFT/OUTER
RIGHT/INNER
D131
D132
ORDER SEPARATELY, CABLE SHOULD REACH FROM AUTOBOOM NODE TO JOHN DEERE RATE CONTROL ECU
CABLE, ISO IMPLEMENT EXTENSION TEE
24' - 115-0171-932
36' - 115-0171-933
ORDER SEPARATELY, CONNECTS ISO IMPLEMENT EXTENSION TEE TO JOHN DEERE PRODUCT CONTROL ECU
TERMINATOR, ACTIVE, POWELL
063-0172-964
CABLE, RAVEN ISO TO ACTIVE TERMINATOR
115-0171-963
12" ISO TEE CABLE
115-0171-960
CABLE, JOHN DEERE ISO TO RAVEN ISO ADAPTER
12" - 115-0171-991
TO ISO ECU (KIT)
TO CAN/PWR TEE
LEFT SOLENOID (PORT 4A)
LEFT PRESS (PORT G1)
LEFT PROP (PORT 5A)
RIGHT SOLENOID (PORT 4B)
RIGHT PRESS (PORT G4)
RIGHT PROP (PORT 13A)
LEFT SOL SENSE
UP
RIGHT SOL SENSE
UP
CENTER SOL UP
SENSE
CONTROL
CENTER SOL DOWN
SENSE
CONTROL
OPEN CENTER VALVE
ISO AUTOBOOM VALVE CABLE
115-0230-095
ULTRAGLIDE XT
ACCUMULATOR POWER
LEFT OUTER SENSOR
LEFT INNER SENSOR
RIGHT INNER SENSOR
RIGHT OUTER SENSOR
CENTER SENSOR
ISO AUTOBOOM NODE: 063-0130-016
ISO AUTOBOOM KIT:
117-0137-037 OR 041

CHAPTER 6

STEERABLE HITCH MINI-CONSOLE CALIBRATION & OPERATION

STEERABLE HITCH MINI-CONSOLE



CALIBRATING THE STEERABLE HITCH SYSTEM

Once the Steerable Hitch system has been installed it must be calibrated to provide optimal steering performance. Complete the following steps to calibrate the Steerable Hitch system.

PROGRAM THE SPRAYER SETTINGS

1. Navigate to Setup Screen #1.
2. Press TOGGLE to toggle between the vehicle models (TA 1200, TA 1600, TA 2400).
3. Measure the distance from the tractor axle to the hitch pin and set this value in the AXLE-2-HITCH field.
4. If the desired units of measure are not US, toggle the units to SI.

NOTE: When the units of measure are changed, all unit-specific settings and data are automatically converted to the new units of measure.

PROGRAM THE LEFT AND RIGHT MIN STEER SETTINGS

1. Navigate to Setup Screen #2.
2. Press ENTER in the L/R MIN STEER field to engage minimum steering control.
3. Manually drive the hitch to the left at the minimum pulse width by either selecting LEFT or by momentarily pushing the MANUAL switch on the switchbox to the left (L).

IMPORTANT: If the hitch doesn't move, raise the Left Min PWM value until the cylinder starts moving. If the hitch moves easily, lower the Left Min PWM value until the cylinder just starts to move when the button is engaged.

4. Press ENTER in the L/R MIN STEER field to engage minimum steering control.
5. Manually drive the hitch to the right at the minimum pulse width by either selecting RIGHT or by momentarily pushing the MANUAL switch on the switchbox to the right (R).

IMPORTANT: If the hitch doesn't move, raise the Right Min PWM value until the cylinder starts moving. If the hitch moves easily, lower the Right Min PWM value until the cylinder just starts to move when the button is engaged.

PROGRAM THE STEERING POSITION SENSOR (SPS) SETTINGS

NOTE: If the SPS calibration values have been incorrectly set, they can be reset back to the factory default by navigating to Setup Screen #5 and pressing ENTER at the RESET SPS option.

1. Set the CT SPS VALUE position.
    a. Navigate to Setup Screen #3.
    b. Place the Steerable Hitch system into MIN MODE.
    c. Adjust the hitch position until the hitch transport locking pin slides in and out easily.
    d. Navigate to Setup Screen #4.
    e. Press ENTER in the CT SPS VALUE field and press CONFIRM to verify the setting.

NOTE: The system is now programmed to recognize the center hitch position.

2. Set the LT SPS MAX position.
    a. Navigate to Setup Screen #3.
    b. Place the Steerable Hitch system into MAX MODE.
    c. Adjust the hitch position to the left of center until the hitch can no longer move.
    d. Navigate to Setup Screen #4.
    e. Press ENTER in the LT SPS MAX field and press CONFIRM to verify the setting.

NOTE: The system is now programmed to recognize the maximum left hitch position.

3. Set the RT SPS MAX position.
   a. Navigate to Setup Screen #3.
   b. Place the Steerable Hitch system into MAX MODE.
   c. Adjust the hitch position to the right of center until the hitch can no longer move.
   d. Navigate to Setup Screen #4.
   e. Press ENTER in the RT SPS MAX field and press CONFIRM to verify the setting.

NOTE: The system is now programmed to recognize the maximum right hitch position.

ZERO THE YAW SENSOR

Complete the following steps to clear the yaw sensor value, which measures the turning speed of the vehicle (degrees/second).

1. Navigate to Setup Screen #5.
2. Stop the vehicle.
3. Press ENTER in the YAW READING field and confirm the displayed yaw offset value.

NOTE: The yaw offset should now be set to 0.

ENTER THE SPEED CAL VALUE

1. Navigate to Setup Screen #6.
2. In the SPEED CAL field, enter the speed cal value that corresponds to the speed sensor being used in the system.

NOTE: If the Garmin Astro II speed sensor is being used, the value is 774 (US).

ZERO ACCELEROMETER VALUES

The accelerometer measures the roll and pitch of the vehicle. Complete the following steps to clear the accelerometer sensor values

1. Navigate to Setup Screen #7.
2. Park the vehicle on level ground.
3. Press ENTER in the ZERO ACC field.

NOTE: The roll and pitch value readings should display 0.

PROGRAM SWITCH BOX STATUS

1. Navigate to Main Screen #2.
2. Press ENTER in the SWITCHBOX to toggle to the desired setting (PRESENT or REMOVED).

OPERATING THE STEERABLE HITCH SYSTEM

There are 5 modes of operating the Steerable Hitch control node: Auto, Center, Bump, Min, and Max. The method for engaging these modes depends on whether or not a switchbox is installed on the system.

SWITCH BOX INSTALLED

FIGURE 1. Top Air Switchbox

NOTE: If the modes do not engage as described below, a condition may have occurred that requires the master switch to be toggled.

- AUTO MODE- When the Steerable Hitch node is in AUTO MODE, the sprayer will compensate for turns made by the tractor to maintain track alignment between the tractor and the sprayer. Once AUTO mode is enabled, the system will default to it when the master switch is toggled. To enable AUTO MODE:

1. Turn on the control console.
2. Toggle the master switch ON.
3. Ensure the proximity switch is activated.
4. Push the AUTO/CENTER switch on the switchbox to AUTO.

- CENTER MODE- When the Steerable Hitch node is in CENTER MODE, the sprayer will align itself as closely as possible to the calibrated zero position. To enable CENTER MODE:

1. Turn on the control console.
2. Toggle the master switch ON.
3. Push the AUTO-CENTER switch on the switchbox to CENTER.

- BUMP MODE- When the Steerable Hitch node is in BUMP mode, the sprayer will control to a fixed target angle. The target angle can be bumped to the left or right of the current target angle by the preset bump rate (refer to Main Screen #3). To enable BUMP MODE:

1. Turn on the control console.
2. Toggle the master switch ON.
3. Ensure the proximity switch is activated.
4. Push the LEFT/RIGHT switch on the switchbox to the desired direction.

- MIN MODE- When the Steerable Hitch node is in MIN MODE, the sprayer is manually driven to the left or the right at the preset minimum pulse width (refer to Setup Screen #2). To enable MIN MODE:

1. Turn on the control console.
2. Toggle the master switch ON.
3. Navigate to Setup Screen #2.
4. Press ENTER in the L/R MIN STEER field.

5. Manually drive the sprayer to the left or right by pushing the MANUAL switch on the switchbox in the desired direction (L or R).

NOTE: The system will continue to drive the coils at the minimum pulse width while the MANUAL (L/R) switch is held.

- MAX MODE- When the Steerable Hitch node is in MAX MODE, the sprayer is manually driven to the left or the right at the preset maximum pulse width (refer to Setup Screen #3). To enable MAX MODE:

1. Turn on the control console.
2. Toggle the master switch ON.
3. Navigate to Setup Screen #3.
4. Press ENTER in the L/R MAX STEER field.
5. Manually drive the sprayer to the left or right by pushing the MANUAL switch on the switchbox in the desired direction (L or R).

NOTE: The system will continue to drive the coils at the maximum pulse width while the MANUAL (L/R) switch is held.

NO SWITCH BOX INSTALLED

- AUTO MODE- When the Steerable Hitch node is in AUTO MODE, the sprayer will compensate for turns made by the tractor to maintain track alignment between the tractor and the sprayer. Once AUTO mode is enabled, the system will default to it when the master switch is toggled. To enable AUTO MODE:

1. Turn on the control console.
2. From Main Screen #1, toggle the master switch ON.
3. Ensure the proximity switch is activated.
4. Press the ENTER button in the ENABLE AUTO field.

- CENTER MODE- When the Steerable Hitch node is in CENTER MODE, the sprayer will align itself as closely as possible to the calibrated zero position. To enable CENTER MODE:

1. Turn on the control console.
2. From Main Screen #1, toggle the master switch ON.
3. Navigate to Main Screen #2.
4. Press the ENTER button in the ENABLE CENTER field.

- BUMP MODE- When the Steerable Hitch node is in BUMP mode, the sprayer will control to a fixed target angle. The target angle can be bumped to the left or right of the current target angle by the preset bump rate (refer to Main Screen #3). To enable BUMP MODE:

1. Turn on the control console.
2. From Main Screen #1, toggle the master switch ON.
3. Ensure the proximity switch is activated.
4. Navigate to Main Screen #2.
5. Press the ENTER button in the ENABLE BUMP L/R field.
6. Select LEFT or RIGHT to move the hitch in the desired direction.

- MIN MODE- When the Steerable Hitch node is in MIN MODE, the sprayer is manually driven to the left or the right at the preset minimum pulse width (refer to Setup Screen #2). To enable MIN MODE:

1. Turn on the control console.
2. From Main Screen #1, toggle the master switch ON.
3. Navigate to Setup Screen #2.
4. Press ENTER in the L/R MIN STEER field.

5. Manually drive the sprayer in the desired direction by selecting LEFT or RIGHT.

NOTE: The system will continue to drive the coils at the minimum pulse width while the LEFT or RIGHT button is depressed.

- MAX MODE- When the Steerable Hitch node is in MAX MODE, the sprayer is manually driven to the left or the right at the preset maximum pulse width (refer to Setup Screen #3). To enable MAX MODE:

1. Turn on the control console.
2. From Main Screen #1, toggle the master switch ON.
3. Navigate to Setup Screen #3.
4. Press ENTER in the L/R MAX STEER field.
5. Manually drive the sprayer in the desired direction by selecting LEFT or RIGHT.

NOTE: The system will continue to drive the coils at the maximum pulse width while the LEFT or RIGHT button is depressed.

CHAPTER 7

SCS SERIES CALIBRATION & OPERATION

SCS SERIES

MAIN SCREEN

STEERABLE HITCH

CTRL MODE: AUTO
TA- 3.0 AA- 5.6

ENABLE HITCH ENA
ENABLE CENTER DIS
ENABLE BUMP DIS

SETTINGS SCREEN

STEERABLE HITCH

CTRL MODE: AUTO

TUNING
MANUAL CONTROL
SENSOR CALIBRATION
MACHINE SETTINGS
SAFETY SETTINGS
DIAGNOSTICS
SERVICE MENU

TUNING PAGE

STEERABLE HITCH

CTRL MODE: AUTO

SPEED 10
SENSITIVITY 16
BUMP RATE 5.0

MANUAL CONTROL

STEERABLE HITCH

CTRL MODE: AUTO

SET LEFT MIN 30
SET RIGHT MIN 30
ENGAGE MIN STEER

SET LEFT MAX 70
SET RIGHT MAX 70
ENGAGE MAX STEER

SENSOR CALIBRATION

STEERABLE HITCH

CTRL MODE: AUTO
ACT ANGLE 32.0
YAW RATE 5.4
ROLL 10.3
PITCH 4.6
LT SPS MAX -34.9
RT SPS MAX 34.9
CT SPS 1.2
RESET SPS
YAW OFFSET 3.4
YAW AUTO ZERO DIS
ACC OFFSET

MACHINE SETTINGS

STEERABLE HITCH

CTRL MODE: AUTO

NODE DIRECTION 2
SW BOX ENA
SPRAYER TYPE 1600
AXLE TO HITCH 45.6

SAFETY SETTINGS

STEERABLE HITCH

CTRL MODE: AUTO

MAX ROLL RATE 20.0
MAX PITCH ANG 40.0
MAX SPEED 14.0

DIAGNOSTICS PAGE

STEERABLE HITCH
TA 33.9 AA 68.2
SPEED 7.6 PWM -70
YAW RATE 6.4
ROLL RATE -2.3
ROLL 3.6 PITCH 8.5
TC 2.454 AC 2.100
3D%- 65 6D%- 91
ENAGAGED HRS- 54.0
RUN HRS- 200.0
HC VOLTAGE 13.5
ALARM: 1
HW VER: A FA VER: A

CALIBRATING THE STEERABLE HITCH SYSTEM

Once the Steerable Hitch system has been installed it must be calibrated to provide optimal steering performance. Complete the following steps to calibrate the Steerable Hitch system.

NOTE: Locate the Steerable Hitch Home Screen by repeatedly pushing the DATA MENU button until the Main Screen (refer to page 41) appears.

PROGRAM THE SPRAYER SETTINGS

1. Navigate to the Machine Settings Screen.
2. Press ENTER to toggle between the vehicle models (e.g., TA 1200, TA 1600, TA 2400).
3. Measure the distance from the tractor axle to the hitch pin and set this value in the AXLE TO HITCH field.
4. If the desired units of measure are not US, toggle the units to SI.

NOTE: Refer to the SCS 4000/5000 Series™ Console Installation & Operation Manual (P/N 016-0159-925) for instructions on setting the units of measure. When the units of measure are changed, all unit-specific settings and data are automatically converted to the new units of measure.

PROGRAM THE LEFT AND RIGHT MIN STEER SETTINGS

1. From the Manual Control Screen, press ENTER in the ENGAGE MIN STEER field to engage minimum steering control.
2. Manually drive the hitch to the left at the minimum pulse width by either pressing the up arrow on the console or by momentarily pushing the MANUAL switch on the switchbox to the left (L).

NOTE: If the hitch doesn't move, raise the Left Min PWM value until the cylinder starts moving. If the hitch moves easily, lower the Left Min PWM value until the cylinder just starts to move when the button is engaged.

3. Press ENTER in the ENGAGE MIN STEER field to engage minimum steering control.
4. Manually drive the hitch to the right at the minimum pulse width by pressing the down arrow or by momentarily pushing the MANUAL switch on the switchbox to the right (R).

NOTE: If the hitch doesn't move, raise the Right Min PWM value until the cylinder starts moving. If the hitch moves easily, lower the Right Min PWM value until the cylinder just starts to move when the button is engaged.

PROGRAM THE STEERING POSITION SENSOR (SPS) SETTINGS

NOTE: If the SPS calibration values have been incorrectly set, they can be reset back to the factory default by navigating to the Sensor Calibration page and pressing ENTER at the Reset SPS option.

1. Set the CT SPS position.
   a. Navigate to the Manual Control Screen.
   b. Place the Steerable Hitch system into MIN MODE. Refer to "Operating the Steerable Hitch System" section on page 44 for further information on adjusting the mode.
   c. Adjust the hitch position until the hitch pins slides in and out easily.
   d. Navigate to the Sensor Calibration Screen and press ENTER in the CT SPS field.

NOTE: The system is now programmed to recognize the center hitch position.

2. Set the LT SPS Max position.
   a. Navigate to the Manual Control Screen.
   b. Place the Steerable Hitch system into the MAX MODE. Refer to the "Operating the Steerable Hitch System" section on page 44 for further information on adjusting the mode.

c. Adjust the hitch position to the left of center until the hitch can no longer move.
d. Navigate to the Sensor Calibration Screen.
e. Press ENTER in the LT SPS MAX field and confirm the setting.

NOTE: The system is now programmed to recognize the maximum left hitch position.

3. Set the RT SPS MAX.
   a. Navigate to the Manual Control Screen.
   b. Place the Steerable Hitch system into the MAX MODE. Refer to the "Operating the Steerable Hitch System" section on page 44 for further information on adjusting the mode.
   c. Adjust the hitch position to the right of center until the hitch can no longer move.
   d. Navigate to the Sensor Calibration Screen.
   e. Press ENTER in the RT SPS MAX field and confirm the setting.

NOTE: The system is now programmed to recognize the maximum right hitch position.

ZERO THE YAW SENSOR

Complete the following steps to clear the yaw sensor value, which measures the turning speed of the vehicle (degrees/second).

1. Navigate to the Sensor Calibration Screen.
2. Stop the vehicle.
3. Press ENTER in the YAW OFFSET field and confirm the displayed yaw offset value.

NOTE: The yaw offset should now be set to 0.

ENTER THE SPEED CAL VALUE

1. Press the SPEED CAL button.
2. Enter the Speed Cal value that corresponds to the speed sensor being used in the system.

NOTE: If the Garmin Astro II speed sensor is being used, the value is 774 (US).

Zero Accelerometer Values

The accelerometer measures the roll and pitch of the vehicle. Complete the following steps to clear the accelerometer sensor values

1. Navigate to the Sensor Calibration Screen.
2. Park the vehicle on level ground.
3. Press ENTER in the ACC OFFSET field.

NOTE: The roll and pitch value readings should display 0.

PROGRAM SWITCH BOX STATUS

1. Navigate to the Machine Settings Screen.
2. Arrow down to SWITCHBOX.
3. Press ENTER to toggle to the desired setting (ENABLED or DISABLED).

OPERATING THE STEERABLE HITCH SYSTEM

There are five modes of operating the Steerable Hitch control node: Auto, Center, Bump, Min, and Max. The method for engaging these modes depends on whether or not a switchbox is installed on the system.

SWITCH BOX INSTALLED

FIGURE 1. Top Air Switchbox

NOTE: If the modes do not engage as described below, a condition may have occurred that requires the master switch to be toggled.

- AUTO MODE- When the Steerable Hitch node is in AUTO MODE, the sprayer will compensate for turns made by the tractor to maintain track alignment between the tractor and the sprayer. Once AUTO mode is enabled, the system will default to it when the master switch is toggled. To enable AUTO MODE:

1. Turn on the control console.
2. Toggle the master switch ON.
3. Ensure the proximity switch is activated.
4. Push the AUTO/CENTER switch on the switchbox to AUTO.

- CENTER MODE- When the Steerable Hitch node is in CENTER MODE, the sprayer will align itself as closely as possible to the calibrated zero position. To enable CENTER MODE:

1. Turn on the control console.
2. Toggle the master switch ON.
3. Push the AUTO-CENTER switch on the switchbox to CENTER.

- BUMP MODE- When the Steerable Hitch node is in BUMP mode, the sprayer will control to a fixed target angle. The target angle can be bumped to the left or right of the current target angle by the preset bump rate (refer to the Tuning Screen). To enable BUMP MODE:

1. Turn on the control console.
2. Toggle the master switch ON.
3. Ensure the proximity switch is activated.
4. Push the LEFT/RIGHT switch on the switchbox to the desired direction.

- MIN MODE- When the Steerable Hitch node is in MIN MODE, the sprayer is manually driven to the left or the right at the preset minimum pulse width (refer to the Manual Control Screen). To enable MIN MODE:

1. Turn on the control console.
2. Toggle the master switch ON.
3. Navigate to the Manual Control Screen.
4. Press ENTER in the ENGAGE MIN STEER field.
5. Manually drive the sprayer to the left or right by pushing the MANUAL switch on the switchbox in the desired direction (L or R).

NOTE: The system will continue to drive the coils at the minimum pulse width while the MANUAL (L/R) switch is held.

- MAX MODE- When the Steerable Hitch node is in MAX MODE, the sprayer is manually driven to the left or the right at the preset maximum pulse width (refer to the Manual Control Screen). To enable MAX MODE:

1. Turn on the control console.
2. Toggle the master switch ON.
3. Navigate to the Manual Control Screen.
4. Press ENTER in the ENGAGE MAX STEER field.
5. Manually drive the sprayer to the left or right by pushing the MANUAL switch on the switchbox in the desired direction (L or R).

NOTE: The system will continue to drive the coils at the maximum pulse width while the MANUAL (L/R) switch is held.

NO SWITCH BOX INSTALLED

- AUTO MODE- When the Steerable Hitch node is in AUTO MODE, the sprayer will compensate for turns made by the tractor to maintain track alignment between the tractor and the sprayer. Once AUTO mode is enabled, the system will default to it when the master switch is toggled. To enable AUTO MODE:

1. Turn on the control console.
2. From the Main Screen, toggle the master switch ON.
3. Ensure the proximity switch is activated.
4. Press the CE button in the ENABLE HITCH field.

- CENTER MODE- When the Steerable Hitch node is in CENTER MODE, the sprayer will align itself as closely as possible to the calibrated zero position. To enable CENTER MODE:

1. Turn on the control console.
2. From the Main Screen, toggle the master switch ON.
3. Press the CE button in the ENABLE CENTER field.

- BUMP MODE- When the Steerable Hitch node is in BUMP mode, the sprayer will control to a fixed target angle. The target angle can be bumped to the left or right of the current target angle by the preset bump rate (refer to the Manual Control Screen). To enable BUMP MODE:

1. Turn on the control console.
2. From the Main Screen, toggle the master switch ON.
3. Ensure the proximity switch is activated.
4. Press the ENTER button in the ENABLE BUMP field.
5. Press the up or down arrow buttons to move the hitch in the desired direction.

- MIN MODE- When the Steerable Hitch node is in MIN MODE, the sprayer is manually driven to the left or the right at the preset minimum pulse width (refer to the Manual Control Screen). To enable MIN MODE:

1. Turn on the control console.
2. From the Main Screen, toggle the master switch ON.
3. Navigate to the Manual Control Screen.

4. Press the ENTER button in the ENAGAGE MIN STEER field.
5. Manually drive the sprayer in the desired direction by pushing the up (left) or down (right) arrow in the desired direction.

NOTE: The system will continue to drive the coils at the minimum pulse width while the arrow button is depressed.

- MAX MODE- When the Steerable Hitch node is in MAX MODE, the sprayer is manually driven to the left or the right at the preset maximum pulse width (refer to the Manual Control Screen). To enable MAX MODE:

1. Turn on the control console.
2. From the Main Screen, toggle the master switch ON.
3. Navigate to the Manual Control Screen.
4. Press the ENTER button in the ENGAGE MAX STEER field.
5. Manually drive the sprayer in the desired direction by pushing the up (left) or down (right) arrow in the desired direction.

NOTE: The system will continue to drive the coils at the maximum pulse width while the arrow button is depressed.

CHAPTER 8

ENVIZIO PRO CALIBRATION & OPERATION

ENVIZIO PRO SCREENS

Refer to the Envizio Pro screen layout on the following page for assistance during calibration and operation of the Steerable Hitch system.

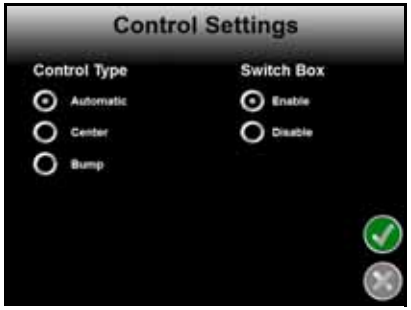
Run Screen

Envizio Pro

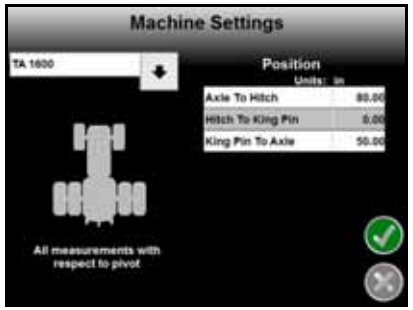
Quick Look Screen

Setup Screen

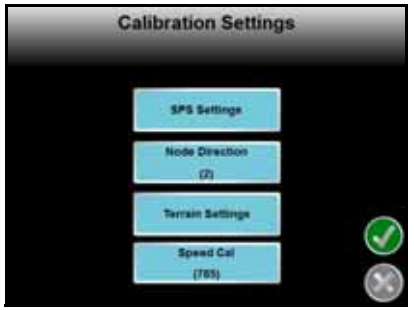
Control



Machine

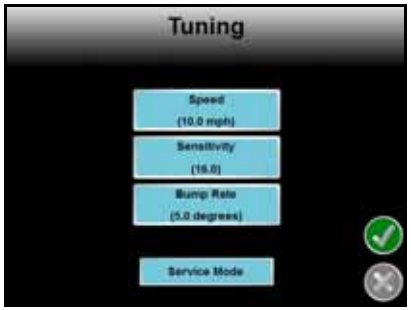


Calibration

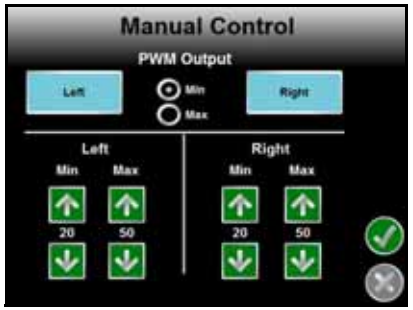


Safety Settings

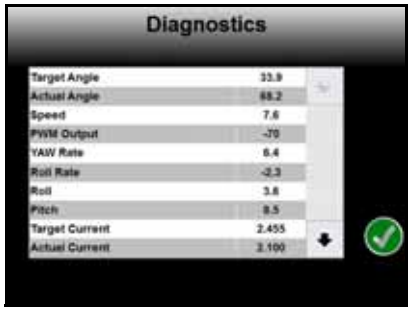
Tuning



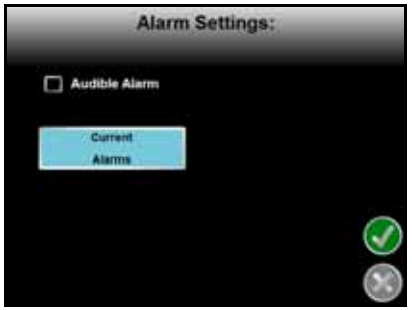
Manual Control



Diagnostic



Alarm Settings



CALIBRATING THE STEERABLE HITCH SYSTEM

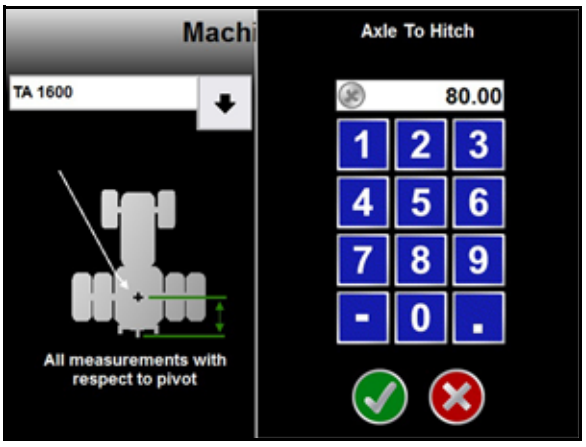
Once the Steerable Hitch system has been installed it must be calibrated to provide optimal steering performance. To begin the calibration process, locate the Steerable Hitch Main Menu by pressing the Steerable Hitch icon on the Envizio Pro Menu.

FIGURE 1. Steerable Hitch Icon

PROGRAM THE SPRAYER SETTINGS

1. Navigate to the Machine Settings Screen from the Setup Screen.
2. Press the drop-down arrow and select the vehicle model (e.g., TA 1200, TA 1600, TA 2400).

FIGURE 2. Offset Setup Screen



3. Measure the distance from the tractor axle to the hitch pin.
4. Select the Axle To Hitch label.
5. Enter the distance value in the Axle To Hitch field.

6. Accept the value by pressing  or press  to cancel and return to the Setup Screen.

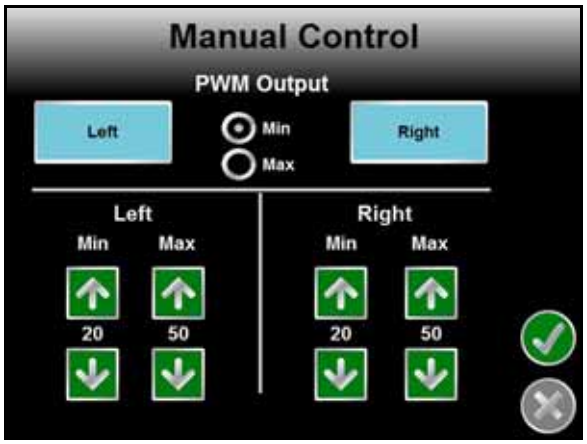
NOTE: The "Hitch To King Pin" and "King Pin To Axle" values can not be manually adjusted.

NOTE: If the desired units of measure are metric, refer to the Envizio Pro Installation & Operation Manual (P/N 016-0171-148) for information on how to adjust the units of measure. When units of measure are changed, all unit-specific settings are automatically calculated to the new unit of measure.

PROGRAM THE LEFT AND RIGHT MIN STEER SETTINGS

1. Navigate to the Manual Control Screen from the Setup Screen.

FIGURE 3. Manual Control Screen



1. From the Manual Control Screen, select Min (located between the Left and Right buttons) for PWM output.
2. Select Left to engage minimum steering control.
3. Manually drive the hitch to the left at the minimum pulse width by holding the Left button.

NOTE: If the hitch does not move, raise the Left Min value until the cylinder just starts to move. If the hitch moves easily, lower the Left Min value until the cylinder just starts to move when the button is engaged.

4. Select Right to engage minimum steering control.
5. Manually drive the hitch to the right at the minimum pulse width by holding the Right button.

NOTE: If the hitch does not move, raise the Right Min value until the cylinder just starts to move. If the hitch moves easily, lower the Right Min value until the cylinder just starts to move when the button is engaged.

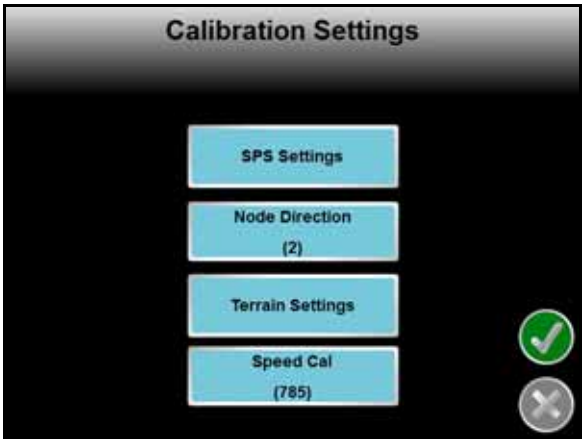
6. Press the  button to accept the values and return to the Setup Screen.

PROGRAM THE STEERING POSITION SENSOR (SPS) SETTINGS

NOTE: If the calibration values are set incorrectly, they can be reset to the factory default values by navigating to the SPS Calibration Screen and selecting Reset.

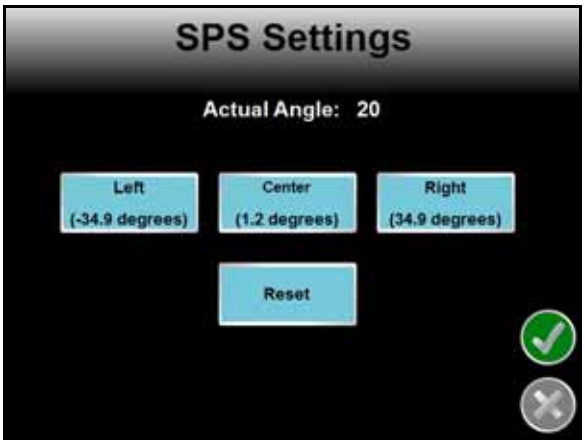
1. Navigate to the Calibration Settings Screen from the Setup Screen.

FIGURE 4. Calibration Settings Screen



1. Select SPS Settings to navigate to the SPS Settings Screen.

FIGURE 5. SPS Settings Screen



2. Set the center SPS position.
   a. Navigate to the Manual Control Screen.
   b. Steer the machine left or right at the minimum values until the safety locking pin easily slides in and out of the locking mechanism.
   c. Navigate back to the SPS Setting Screen.
   d. Select Center to accept the new center position.

NOTE: The system is now programmed to recognize the center hitch position.

3. Set the left SPS position.
   a. Navigate to the Manual Control Screen.
   b. Steer the machine left at the maximum value until the hitch reaches its maximum left position.
   c. Navigate back to the SPS Setting Screen.
   d. Select Left to accept the new left position.

NOTE: The system is now programmed to recognize the maximum left hitch position.

4. Set the right SPS position.
   a. Navigate to the Manual Control Screen.

b. Steer the machine right at the maximum value until the hitch reaches its maximum right position.
c. Navigate back to the SPS Setting Screen.
d. Select Right to accept the new right position.

NOTE: The system is now programmed to recognize the maximum right hitch position.

ZERO THE YAW SENSOR AND ACCELEROMETER

Complete the following steps to clear the yaw sensor value, which measures the turning speed of the vehicle (degrees/second).

1. Navigate to the Calibration Settings Screen and then to the Terrain Settings Screen.
2. Stop the vehicle on flat, level ground.
3. Press Zero Yaw button and confirm the displayed yaw offset value.

NOTE: The yaw rate should now display 0.

ENTER THE SPEED CAL VALUE

1. Navigate to the Calibration Settings Screen.
2. Select Speed Cal.
3. Enter the Speed Cal value that corresponds to the speed sensor being used in the system.

NOTE: If the Garmin Astro II speed sensor is being used, the value is 774 (US).

PROGRAM SWITCH BOX STATUS

1. Navigate to the Control Settings Screen.
2. Select the desired Switch Box status, depending on if the switch box has Steerable Hitch functionality.

OPERATING THE STEERABLE HITCH SYSTEM

There are five modes of operating the Steerable Hitch control node: Auto, Center, Bump, Min, and Max. The method for engaging these modes depends on whether or not a switchbox is installed on the system.

SWITCH BOX INSTALLED

FIGURE 6. Top Air Switchbox

NOTE: If the modes do not engage as described below, a condition may have occurred that requires the master switch to be toggled.

- AUTO MODE- When the Steerable Hitch node is in AUTO MODE, the sprayer will compensate for turns made by the tractor to maintain track alignment between the tractor and the sprayer. Once AUTO mode is enabled, the system will default to it when the master switch is toggled. To enable AUTO MODE:

1. Turn on the control console.
2. Toggle the master switch ON.
3. Ensure the proximity switch is activated.
4. Push the AUTO/CENTER switch on the switchbox to AUTO.

- CENTER MODE- When the Steerable Hitch node is in CENTER MODE, the sprayer will align itself as closely as possible to the calibrated zero position. To enable CENTER MODE:

1. Turn on the control console.
2. Toggle the master switch ON.
3. Push the AUTO-CENTER switch on the switchbox to CENTER.

- BUMP MODE- When the Steerable Hitch node is in BUMP mode, the sprayer will move a fixed number of degrees. The BUMP MODE is set in the Tuning Screen under Bump Rate. To enable BUMP MODE:

1. Turn on the control console.
2. Toggle the master switch ON.
3. Ensure the proximity switch is activated.
4. Push the MANUAL (L/R) switch on the switchbox to the desired direction.

- MIN MODE- When the Steerable Hitch node is in MIN MODE, the sprayer is manually driven to the left or the right at the preset minimum pulse width (refer to the Manual Control Screen). To enable MIN MODE:

1. Turn on the control console.
2. Toggle the master switch ON.
3. Navigate to the Manual Control Screen.
4. Select Min under PWM output.

5. Manually drive the sprayer to the left or right by pushing the MANUAL L/R switch on the switchbox in the desired direction (L or R).

NOTE: The system will continue to drive the coils at the minimum pulse width while the MANUAL (L/R) switch is held.

- MAX MODE- When the Steerable Hitch node is in MAX MODE, the sprayer is manually driven to the left or the right at the preset maximum pulse width (refer to the Manual Control Screen). To enable MAX MODE:

1. Turn on the control console.
2. Toggle the master switch ON.
3. Navigate to the Manual Control Screen.
4. Select Max under PWM output.
5. Manually drive the sprayer to the left or right by pushing the MANUAL L/R switch on the switchbox in the desired direction (L or R).

NOTE: The system will continue to drive the coils at the maximum pulse width while the MANUAL (L/R) switch is held.

NO SWITCH BOX INSTALLED

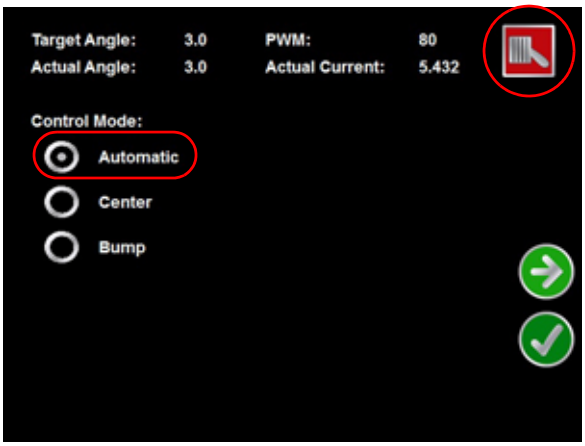
- AUTO MODE - When the Steerable Hitch node is in AUTO MODE, the sprayer will compensate for turns made by the tractor to maintain track alignment between the tractor and the sprayer. When AUTO mode is enabled, the system will default to it when the master switch is toggled. To enable AUTO MODE:

1. Turn on the control console.

FIGURE 7. Run Screen

2. From the Run Screen, navigate to the Steerable Hitch Quick Look Screen.

FIGURE 8. Steerable Hitch Quick Look Screen



3. Ensure the proximity switch is activated.
4. Ensure Automatic Control Mode is selected.
5. From the Quick Look Screen, toggle the master switch ON.

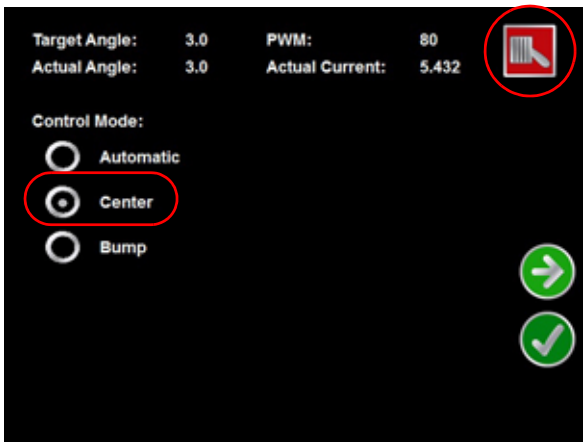
- CENTER MODE - When the Steerable Hitch node is in CENTER MODE, the sprayer will align itself as closely as possible to the calibrated zero position. To enable CENTER MODE:

1. Turn on the control console.

FIGURE 9. Run Screen

2. From the Run Screen, navigate to the Steerable Hitch Quick Look Screen.

FIGURE 10. Steerable Hitch Quick Look Screen



3. Ensure the proximity switch is activated.
4. Ensure Center Control Mode is selected.
5. From the Quick Look Screen, toggle the master switch ON.

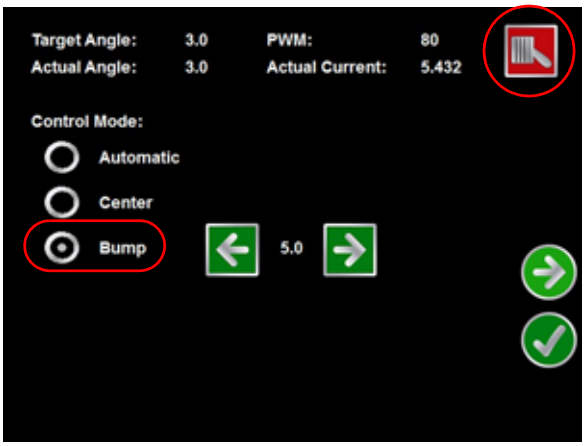
- BUMP MODE - When the Steerable Hitch node is in BUMP mode, the sprayer will control to a fixed target angle. The target angle can be bumped to the left or right of the current target angle by the preset bump rate (refer to the Manual Control Screen). To enable BUMP MODE:

1. Turn on the control console.

FIGURE 11. Run Screen

2. From the Run Screen, navigate to the Steerable Hitch Quick Look Screen.

FIGURE 12. Steerable Hitch Quick Look Screen



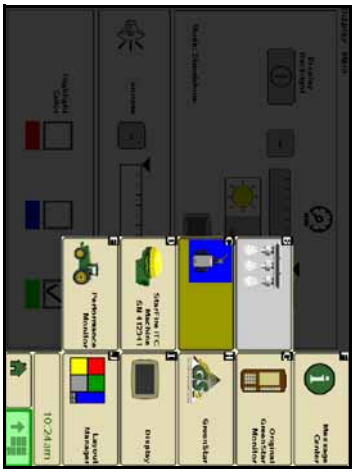
3. Ensure the proximity switch is activated.
4. Ensure Bump Control Mode is selected.
5. Use the arrow buttons to adjust the bump value.
6. From the Quick Look Screen, toggle the master switch ON.

CHAPTER 9 ISO CALIBRATION & OPERATION

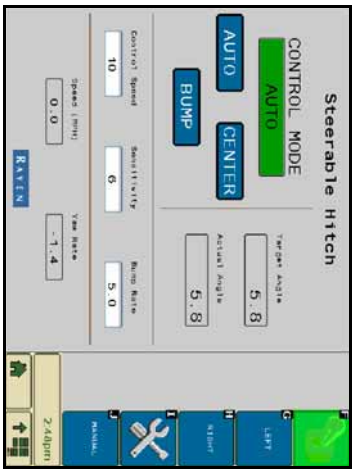
ISO SCREENS

Refer to the ISO screen layout on the following pages for assistance during calibration and operation of the ISO Steerable Hitch system.

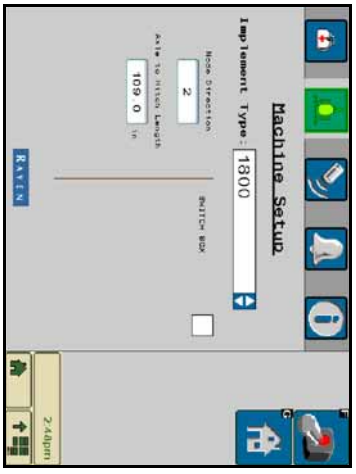
ISO



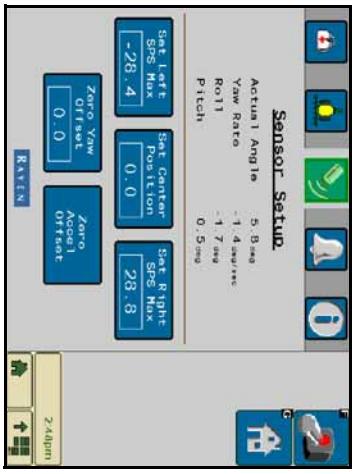
Main Menu



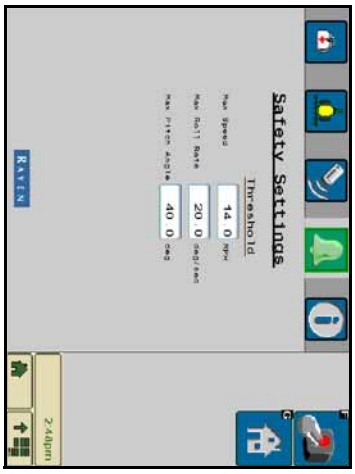
Machine Settings



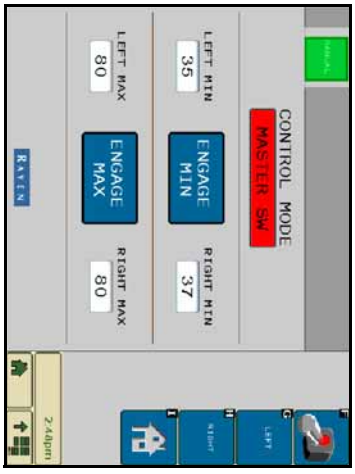
Sensor Setup



Safety Settings



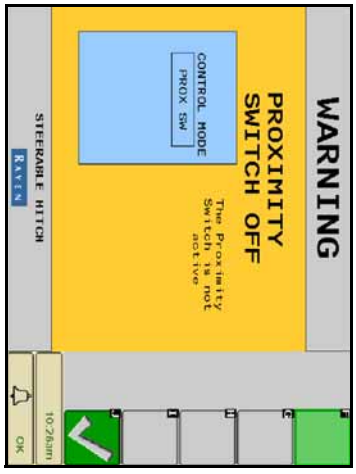
Manual Control



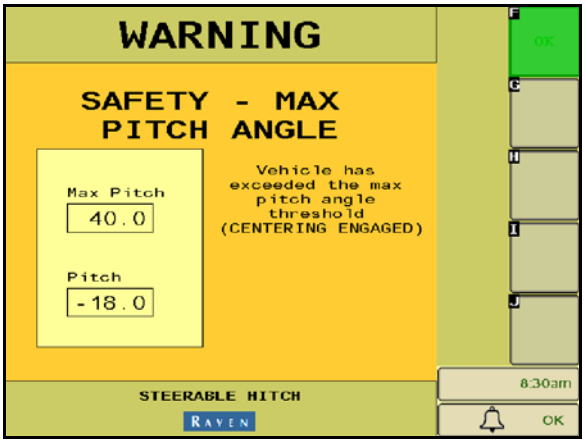
Diagnostics

Reset Alarm

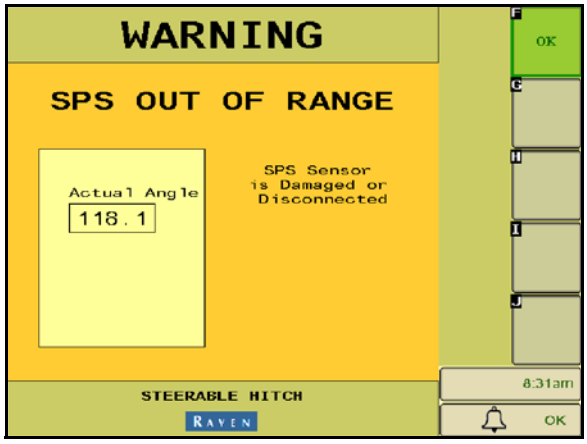
Proximity Switch



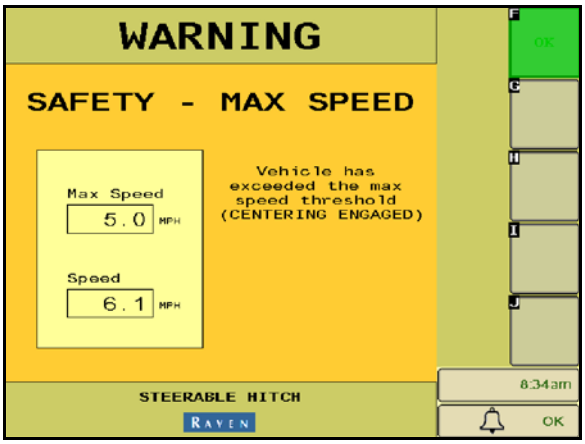
Max Pitch Angle Alarm



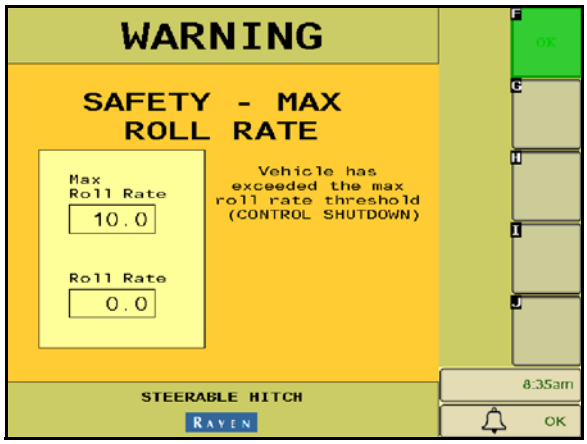
SPS Out of Range Alarm



Max Speed Alarm



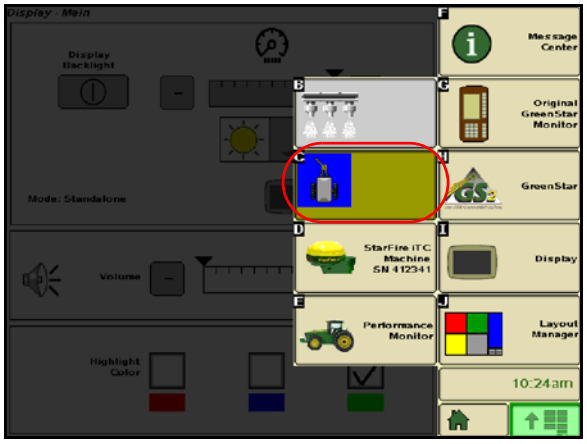
Max Roll Rate Alarm



CALIBRATING THE STEERABLE HITCH SYSTEM

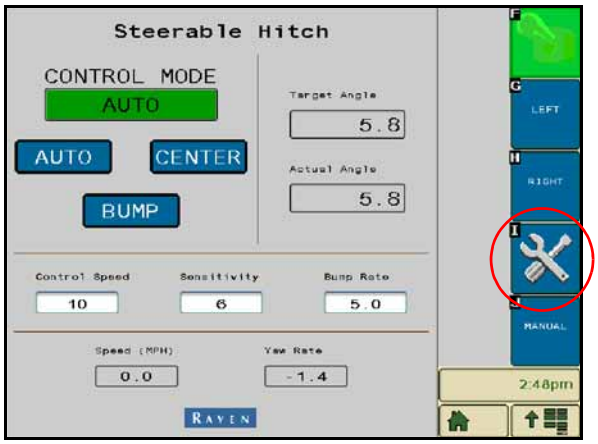
Once the Steerable Hitch system has been installed it must be calibrated to provide optimal steering performance. To begin the calibration process, locate the Steerable Hitch Main Menu by pressing the Steerable Hitch icon on the ISO Menu.

FIGURE 1. Steerable Hitch Icon



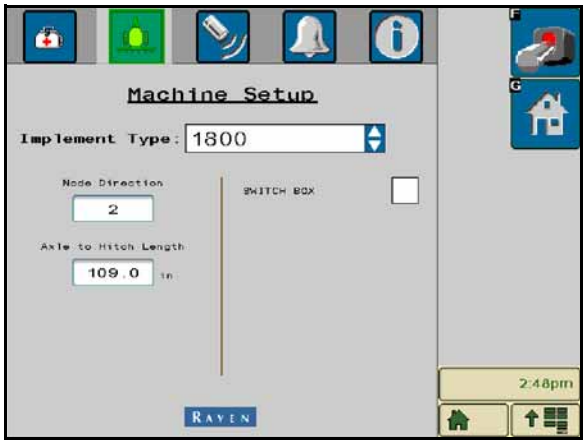
PROGRAM THE SPRAYER SETTINGS

FIGURE 2. Main Menu



1. Navigate to the Machine Settings Screen by selecting the Tools icon and then the Sprayer icon.

FIGURE 3. Machine Settings Screen



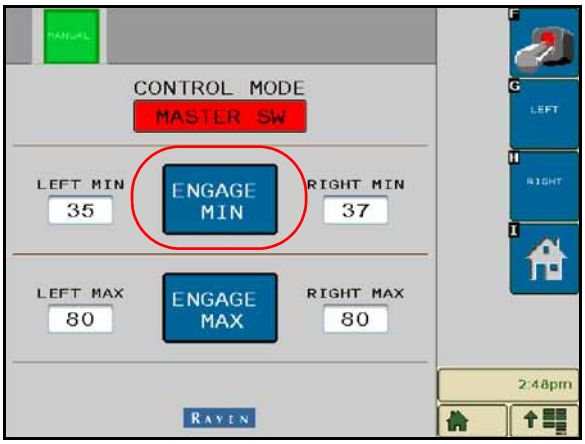
2. Press the drop-down arrow and select the vehicle model (e.g., TA 1200, TA 1600, TA 2400).

3. Measure the distance from the tractor axle to the hitch pin.
4. Enter the distance value in the Axle To Hitch Length field.

PROGRAM THE LEFT AND RIGHT MIN STEER SETTINGS

1. Navigate to the Manual Control Screen by selecting the Manual button along the right side of the Home screen.

FIGURE 4. Manual Control Screen



2. From the Manual Control Screen, select Engage Min (located between the Left and Right values).
3. Manually drive the hitch to the left at the minimum pulse width by holding the Left button located at the right edge of the screen.

NOTE: If the hitch does not move, raise the Left Min value until the cylinder just starts to move. If the hitch moves easily, lower the Left Min value until the cylinder just starts to move when the button is engaged.

4. Manually drive the hitch to the right at the minimum pulse width by holding the Right button located at the right edge of the screen.

NOTE: If the hitch does not move, raise the Right Min value until the cylinder just starts to move. If the hitch moves easily, lower the Right Min value until the cylinder just starts to move when the button is engaged.

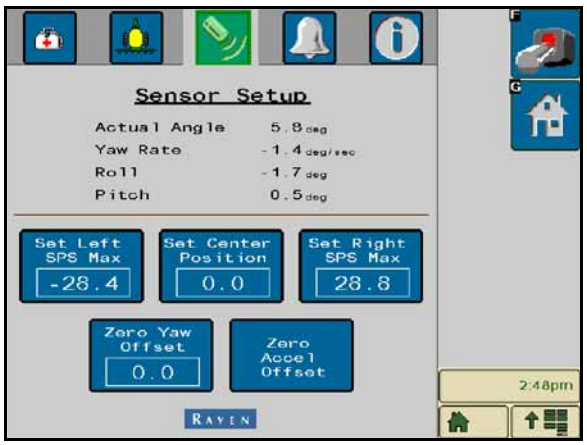
5. Press the  button to accept the values and return to the Home Screen.

PROGRAM THE STEERING POSITION SENSOR (SPS) SETTINGS

NOTE: If the calibration values are set incorrectly, they can be reset to the factory default values by navigating to the SPS Calibration Screen and selecting Reset.

1. Navigate to the Sensor Setup Screen by selecting the Tools icon and then the Sensor icon.

FIGURE 5. Sensor Setup Screen



2. Set the center SPS position.
   a. Navigate to the Manual Control Screen.
   b. Steer the machine left or right at the minimum values until the safety locking pin easily slides in and out of the locking mechanism.
   c. Navigate back to the Sensor Setup Screen.
   d. Select Set Center Position to accept the new center position.

NOTE: The system is now programmed to recognize the center hitch position.

3. Set the left SPS position.
   a. Navigate to the Manual Control Screen.
   b. Steer the machine left at the maximum value until the hitch reaches its maximum left position.
   c. Navigate back to the Sensor Setup Screen.
   d. Select Set Left SPS Max to accept the new left position.

NOTE: The system is now programmed to recognize the maximum left hitch position.

4. Set the right SPS position.
   a. Navigate to the Manual Control Screen.
   b. Steer the machine right at the maximum value until the hitch reaches its maximum right position.
   c. Navigate back to the Sensor Setup Screen.
   d. Select Set Right SPS Max to accept the new right position.

NOTE: The system is now programmed to recognize the maximum right hitch position.

ZERO THE YAW SENSOR AND ACCELEROMETER

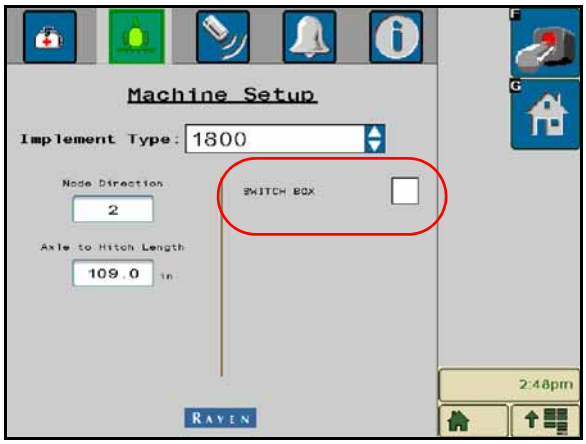
Complete the following steps to clear the yaw sensor value, which measures the turning speed of the vehicle (degrees/second).

1. Navigate to the Calibration Settings Screen and then to the SPS Settings Screen.
2. Stop the vehicle on flat, level ground.
3. Press the Zero Accel Offset button and confirm the displayed yaw offset value.

NOTE: The yaw rate should now display 0.

PROGRAM SWITCH BOX STATUS

FIGURE 6. Machine Settings Screen



1. Navigate to the Machine Settings Screen.
2. Select the desired Switch Box status to enable switch box control of the Steerable Hitch system, depending on if the switch box has Steerable Hitch functionality.

NOTE: The Switch Box status is usually enabled.

OPERATING THE STEERABLE HITCH SYSTEM

There are five modes of operating the Steerable Hitch control node: Auto, Center, Bump, Min, and Max. The method for engaging these modes depends on whether or not a switchbox is installed on the system.

SWITCHBOX INSTALLED

FIGURE 7. Top Air Switchbox

NOTE: If the modes do not engage as described below, a condition may have occurred that requires the master switch to be toggled.

- AUTO MODE- When the Steerable Hitch node is in AUTO MODE, the sprayer will compensate for turns made by the tractor to maintain track alignment between the tractor and the sprayer. Once AUTO mode is enabled, the system will default to it when the master switch is toggled. To enable AUTO MODE:

1. Turn on the control console.
2. Toggle the master switch ON.
3. Ensure the proximity switch is activated.
4. Push the AUTO/CENTER switch on the switchbox to AUTO.

- CENTER MODE- When the Steerable Hitch node is in CENTER MODE, the sprayer will align itself as closely as possible to the calibrated zero position. To enable CENTER MODE:

1. Turn on the control console.
2. Toggle the master switch ON.
3. Push the AUTO-CENTER switch on the switchbox to CENTER.

- BUMP MODE- When the Steerable Hitch node is in BUMP mode, the sprayer will move a fixed number of degrees. The BUMP MODE is set in the Home Screen under Bump Rate. To enable BUMP MODE:

1. Turn on the control console.
2. Toggle the master switch ON.
3. Ensure the proximity switch is activated.
4. Push the MANUAL (L/R) switch on the switchbox to the desired direction.

- MIN MODE- When the Steerable Hitch node is in MIN MODE, the sprayer is manually driven to the left or the right at the preset minimum pulse width (refer to the Manual Control Screen). To enable MIN MODE:

1. Turn on the control console.
2. Toggle the master switch ON.
3. Navigate to the Manual Control Screen.
4. Select Engage Min.

5. Manually drive the sprayer to the left or right by pushing the MANUAL L/R switch on the switchbox in the desired direction (L or R).

NOTE: The system will continue to drive the coils at the minimum pulse width while the MANUAL (L/R) switch is held.

- MAX MODE- When the Steerable Hitch node is in MAX MODE, the sprayer is manually driven to the left or the right at the preset maximum pulse width (refer to the Manual Control Screen). To enable MAX MODE:

1. Turn on the control console.
2. Toggle the master switch ON.
3. Navigate to the Manual Control Screen.
4. Select Engage Max.
5. Manually drive the sprayer to the left or right by pushing the MANUAL L/R switch on the switchbox in the desired direction (L or R).

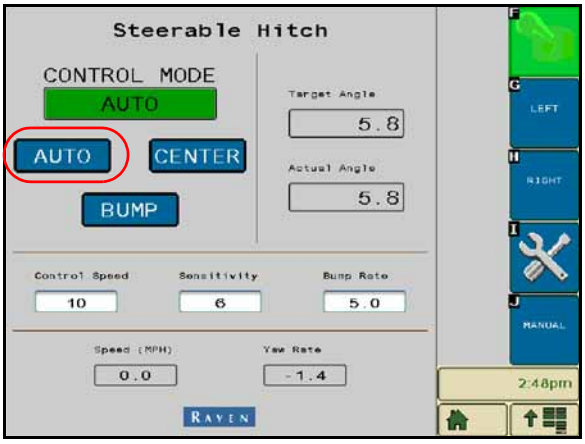
NOTE: The system will continue to drive the coils at the maximum pulse width while the MANUAL (L/R) switch is held.

NO SWITCHBOX INSTALLED

- AUTO MODE - When the Steerable Hitch node is in AUTO MODE, the sprayer will compensate for turns made by the tractor to maintain track alignment between the tractor and the sprayer. When AUTO mode is enabled, the system will default to it when the master switch is toggled. To enable AUTO MODE:

1. Turn on the control console.
2. From the Run Screen, navigate to the Steerable Hitch Main Menu.

FIGURE 8. Main Menu

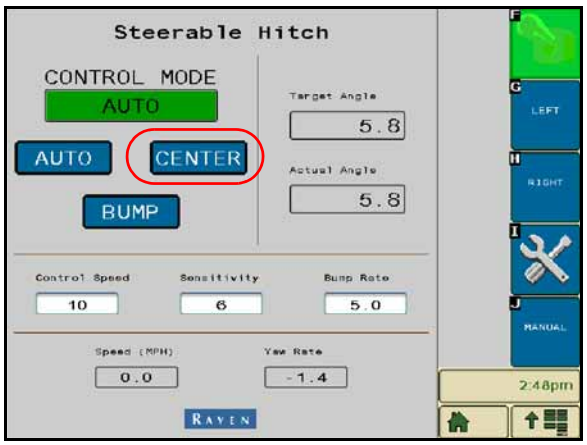


3. From the Main Menu, ensure the master switch is activated under CONTROL MODE.
4. Select AUTO.
5. Toggle the master switch ON.

- CENTER MODE - When the Steerable Hitch node is in CENTER MODE, the sprayer will align itself as closely as possible to the calibrated zero position. To enable CENTER MODE:

1. Turn on the control console.

FIGURE 9. Main Menu

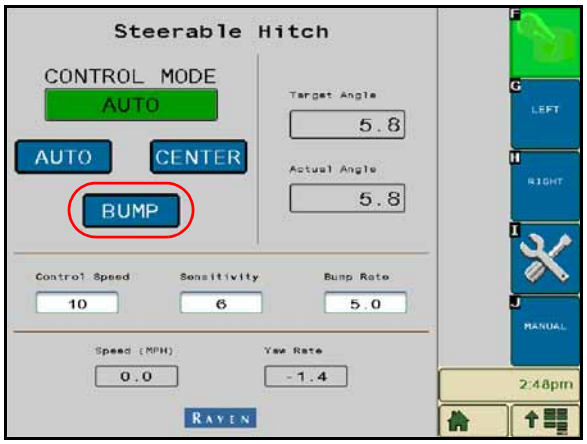


2. From the Main Menu, ensure the master switch is activated under CONTROL MODE.
3. Select CENTER.
4. Toggle the master switch ON.

- BUMP MODE- When the Steerable Hitch node is in BUMP mode, the sprayer will move a fixed number of degrees. The BUMP MODE is set in the Home Screen under Bump Rate. To enable BUMP MODE:

1. Turn on the control console.

FIGURE 10. Main Menu



2. From the Main Menu, ensure the master switch is activated under CONTROL MODE.
3. Select BUMP.
4. Use the arrow buttons to adjust the bump value.
5. Toggle the master switch ON.

- MIN MODE- When the Steerable Hitch node is in MIN MODE, the sprayer is manually driven to the left or the right at the preset minimum pulse width (refer to the Manual Control Screen). To enable MIN MODE:

1. Turn on the control console.
2. Ensure the master switch is activated under CONTROL MODE.
3. Navigate to the Manual Control Screen.
4. Select Engage Min.

5. Manually drive the sprayer to the left or right by holding the LEFT or RIGHT button on the right edge of the screen.

NOTE: The system will continue to drive the coils at the minimum pulse width while the LEFT or RIGHT button is held.

- MAX MODE- When the Steerable Hitch node is in MAX MODE, the sprayer is manually driven to the left or the right at the preset maximum pulse width (refer to the Manual Control Screen). To enable MAX MODE:

1. Turn on the control console.
2. Ensure the master switch is activated under CONTROL MODE.
3. Navigate to the Manual Control Screen.
4. Select Engage Max.
5. Manually drive the sprayer to the left or right by holding the LEFT or RIGHT button on the right edge of the screen.

NOTE: The system will continue to drive the coils at the minimum pulse width while the LEFT or RIGHT button is held.

CHAPTER 10 SYSTEM FEATURES

FEATURE DESCRIPTIONS

Field	Description
CTRL MODE	This feature displays the current steering mode (Auto/Manual/Min/Max/Center). When using the Steerable Hitch Mini-Console, this feature also functions as a master switch if no switchbox is present.
ENABLE HITCH ENABLE AUTO	When the master switch is on, this feature automatically turns the hitch to align with the tractor wheels.
HITCH ANG ERR	Displays the difference between the current hitch angle and the hitch target angle. This value should be near zero during operation.
ENABLE CENTER	When the master switch is on, this feature automatically turns the hitch to a centered position. Once the hitch is centered, the master switch must be toggled to re-engage steering.
ENABLE BUMP ENABLE BUMP L/R	When the master switch is on, this feature automatically bumps the hitch out to a fixed angular amount on each left/right key toggle. It continues to steer to that position until another position is set.
SW BOX SWITCHBOX	This feature toggles between present and removed to indicate to the node whether a switchbox is installed on the system. The default setting is PRESENT or EN.
SPEED (CONTROL)	This feature is used to set the aggressiveness of the control response. If the system is turning too aggressively, lower the value. If the system appears sluggish, increase the value. The default setting is 10.
SENSITIVITY	Used to set the system's responsiveness in changing the target angle to compensate for changes in the vehicle's direction. By increasing this value, the system will be more responsive to changes in vehicle direction. By decreasing this value, the system will be less responsive to changes in vehicle direction. The default setting is 10.
BUMP RATE	Displays the degrees the hitch will change when the steering mode is set to bump and the left or right toggle is engaged. The default setting is 5.0.
SPRAYER TYPE SPRAYER	Toggles between sprayer types 1200, 1600, and 2400. This number should be set to the corresponding sprayer model. The default setting is 1600.
AXLE TO HITCH AXLE-2-HITCH	Length from the center of the hitch pin to the center of the tractor axle (inches or centimeters). The default setting is 45.5.
UNITS	Toggles the display of units of measure (in/cm and mph/kph). The default setting is US measurements.
SET LEFT MIN LEFT MIN PWM	Sets the minimum pulse-width to drive the left steering valve. The default setting is 30.
SET RIGHT MIN RIGHT MIN PWM	Sets the minimum pulse-width to drive the right steering valve. The default setting is 30.

Field	Description
ENGAGE MIN STEER L/R MIN STEER	Once engaged, this feature allows manual steering of the hitch in either the left or right direction at the current minimum pulse-width setting.
SET LEFT MAX LEFT MAX PWM	Sets the maximum pulse-width to drive the left steering valve. The default setting is 70.
SET RIGHT MAX RIGHT MAX PWM	Sets the maximum pulse-width to drive the right steering valve. The default setting is 70.
ENGAGE MAX STEER L/R MAX STEER	Once engaged, this feature allows manual steering of the hitch in either the left or right direction at the current maximum pulse-width setting.
LT SPS MAX	Sets and displays the left-most hitch angle the system will control before stopping. The default setting is -35.0.
RT SPS MAX	Sets and displays the right-most hitch angle the system will control before stopping. The default setting is 35.0.
CT SPS CT SPS VALUE	Sets and displays the current offset value from the expected zero position. When set, the value will define the actual center position of the hitch. The default setting is 0. NOTE: The value in the CT SPS Value determines the position to which the hitch is centered. It is important to set this value correctly as it determines how straight the sprayer drives in relation to the tractor.
RESET SPS	Resets the Left SPS Max, Right SPS Max, and the CT SPS Offset to the factory default.
YAW OFFSET YAW READING	This feature displays the current yaw offset value in degrees/seconds. If selected, the operator can manually set the zero position of the yaw sensor. The default setting is 0.0. NOTE: The vehicle must be stopped and the hitch stationary before adjusting this value.
YAW AUTO ZERO	This feature can be toggled on/off, and automatically zeros the yaw sensor whenever the hitch is stationary and zero speed is detected. The default setting is OFF.
SPEED CAL	Sets the ratio of the speed pulses read from the speed sensor to a mph (kph) value. The default setting 774 (200).
MAX SPEED	This feature sets the maximum speed the vehicle can travel before steering disengages and centers. The default setting is 14.0 (22.5).
MAX PITCH ANG	The maximum downward slope the sprayer can be driving before steering disengages and centers. The default setting is 40.0.
MAX ROLL RATE	The maximum change in the sprayer's tilt angle per second that is allowed before the steering disengages. The default setting is 20.0.
NODE DIRECTION NODE ORIENT	This feature identifies the correct directions for measurement of pitch and roll. The default setting is 2. NOTE: There are six arrows engraved into the node enclosure. The number entered into the Node Orient field should be the number of the arrow pointing forward, toward the tractor.
ACC OFFSET ZERO ACC	This feature manually sets the zero position for the roll and pitch sensor measurements. This procedure should be performed on level ground.
SERVICE MENU SERVICE CODE KEY	This is an advanced feature for product support diagnostics.
TA	The current angle the hitch is targeting.

Field	Description
ACT ANGLE AA	The current angle of the hitch.
SPEED (VEHICLE)	The current speed of the vehicle.
PWM	The current pulse-width being driven to the steering coils. A negative number indicates this value is for the left coil. A positive number indicates the value is for the right coil.
YAW RATE YR	The current yaw rate measurement on the node.
ROLL RATE RR	The current roll rate measurement on the node.
ROLL RL	The current roll angle of the node.
PITCH PTH	The current pitch angle of the node.
TC	The coil current the hitch is targeting. This value is displayed only in current comp mode.
AC	The actual current at which the coil is being driven. A negative number indicates this value is for the left coil. A positive number indicates this value is for the right coil.
3D% 3D	Percentage of time in the last 15 minutes the hitch angle has been within +/- three degrees of the target angle. This value is calculated only when the system is active and is zeroed out when the system is powered down.
6D% 6D	Percentage of time in the last 15 minutes the hitch angle has been within +/- six degrees of the target angle. This value is calculated only when the system is active and is zeroed out when the system is powered down.
ENGAGED HOURS EN RUNTIME	Amount of time the node has been engaged during the life of the node.
RUN HRS ST RUNTIME	Amount of time the node has been engaged while running the current software version.
HC VOLTAGE VOLT	The high current voltage of the node.
ALARM ALRM#	An error code reference number for the active alarms on the system. Refer to Chapter 11, Troubleshooting on page 75 for further information.
PGM	The current node program number.
VER	The current node program version.
HW VER HW VR	The current node hardware version.
FA VER FA VR	The current node assembly version.
SERIAL NUM	The serial number of the node.
PCB ASSY	The PCB board number in the node.
BOOTLOADER VER	The bootloader version in the node.
FINAL ASSY	The enclosure assembly number of the node.

SAFETY FEATURES

The Steerable Hitch system comes with three safety settings that can be modified through the console when maneuvering challenging terrain: max speed (default 14 mph), max pitch angle (default 40 degrees), and max roll (default 20 degrees/second). These features cannot be increased from the default setting, but can be decreased to reduce risk. When the max speed and max pitch angle conditions are met, the hitch will begin steering to a centered position and then shut off all control to ensure the hitch is in a safe position during transport and when turning on steep terrain. When the max roll rate condition is met, the hitch will stop controlling all together to prevent compensation for a false yaw measurement when the sprayer drops into a hole in the field. After any of the three of these conditions are met, a master switch toggle is required to re-engage steering.

CHAPTER 11 TROUBLESHOOTING

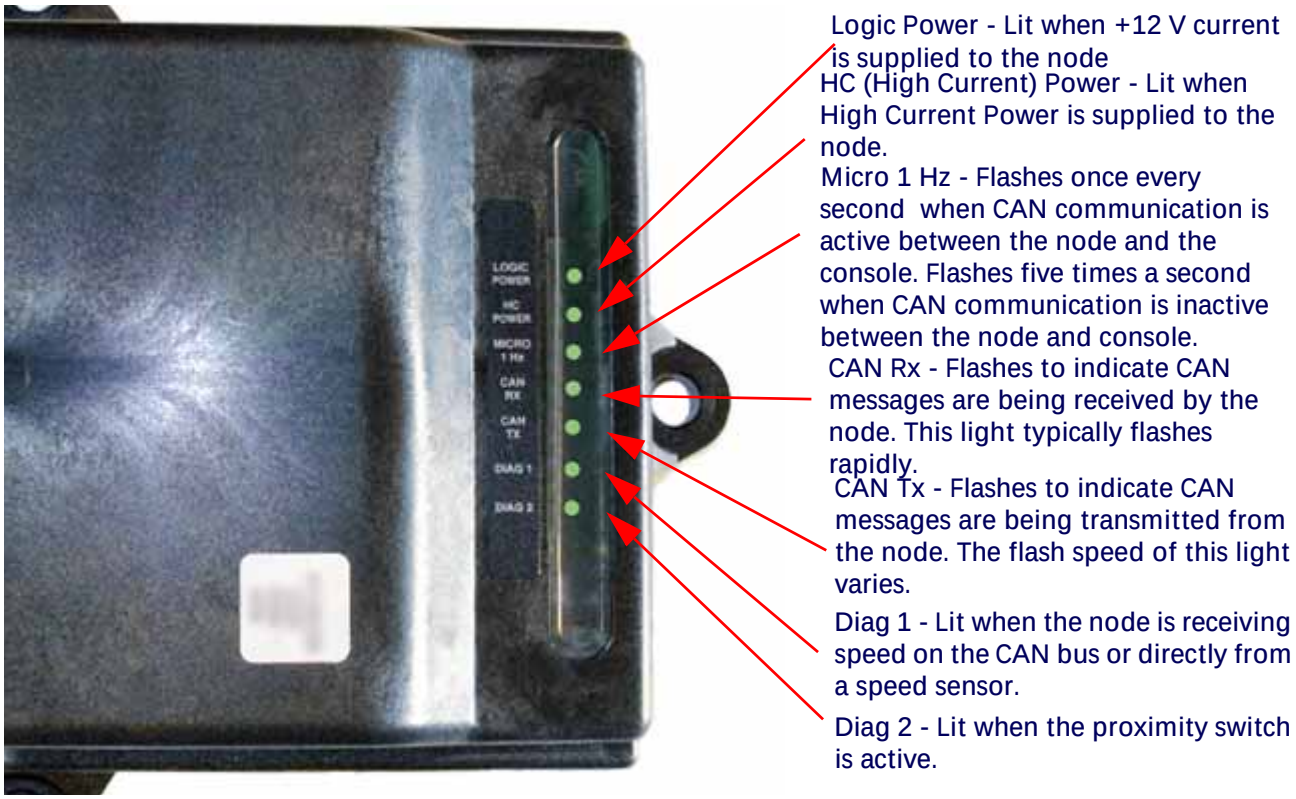
TROUBLESHOOTING

NODE

The CAN control node features several green light-emitting diodes (LEDs) which may be used to diagnose issues within the Steerable Hitch system.

NOTE: If the LEDs are not displayed as outlined in the figure below or are all on continuously, check the CAN connections and the control cable connections on the node. If the issue persists, contact your local Raven dealer for additional technical support.

FIGURE 1. CAN Control Node LEDs



SYSTEM ALARMS

Alarm	Alarm # - Hex	Alarm # - Dec	Cause
Proximity Sw Off	0x0001	1	The user attempted to engage Auto/Manual mode with the proximity switch turned off.
Invalid Hardware	0x0002	2	The node hardware is not compatible with the current software version.
Bad Yaw Sensor	0x0004	4	The yaw sensor in the node is damaged or not connected.
Bad Accelerometer	0x0008	8	The accelerometer in the node is damaged or not connected.
SPS Out of Range	0x0010	16	The SPS sensor is damaged or not connected.
Safety-Max Speed	0x0020	32	A max speed condition has been detected.
Safety-Max Roll Rate	0x0040	64	A max roll rate condition has been detected.
Safety-Max Pitch Ang	0x0080	128	A max pitch angle condition has been detected.
Current Comp Bad Pwr	0x0100	256	The system voltage is out of range for the node.
Hitch Not Responding	0x0400	512	There is a problem with the hydraulics, cabling, or node that is not allowing steering to engage.
SH HC Pwr Disconnect	0x8000	32768	The node does not have high current power connected.
No Comm with SH Node	N/A	N/A	The node has no power or has lost communication.

SYSTEM ISSUES

To obtain satisfactory hitch steering, all of the sensors must be fully operational. Verify the following sensors are operational: speed sensor, position sensor, proximity switch, and node sensors (yaw, roll, pitch). If the system is not operating satisfactorily after verifying sensor operation, refer to the following table to improve hitch steering performance.

Symptom	Possible Cause	Solution
System too aggressive upon initial startup	Hydraulics not up to operating temperature	Allow system hydraulics to warm up before enabling Steerable Hitch
	Speed parameter is set too high	Decrease Speed parameter
		Enable Current Compensation

Symptom	Possible Cause	Solution
System too sluggish or too aggressive during routine operation	Speed parameter is set too low (sluggish)	Increase Speed parameter
	Speed parameter is set too high (aggressive)	Decrease Speed parameter
	System hydraulics set too low (sluggish)	Increase tractor hydraulic flow
	System PWM mins set too low (sluggish)	Increase PWM mins on Right and Left by one until achieving satisfactory performance
	System PWM mins set too high (aggressive)	Decrease PWM mins on Right and Left by one until achieving satisfactory performance
System does not return to the center of the tow vehicle track when driving straight ahead	Sensitivity parameter too high	Lower Sensitivity parameter
	Yaw sensor is offset too far	1. Stop the vehicle 2. Inspect YR value on diagnostics Screen 3. Re-zero on Setup Screen if greater than 1 or less than -1
	Hitch center position offset	Re-center hitch, lock center locking mechanism, and reset SPS center position on Setup Screen
Hitch does not respond to controls	Switchbox not detected, but connected to system	1. Inspect cabling 2. Ensure "Switchbox Present" is selected
	Hydraulics not engaged	Engage hydraulics
	Booms not unfolded (proximity switch)	Unfold booms
	Hitch locking mechanism in place	Remove hitch locking mechanism
	Insufficient high current power	Inspect node high current lights and check fuses
	Master switch not toggled	Toggle the master switch off and on
	No speed input to system	Check speed on Diagnostics Screen and check speed source connections and functionality

Hydraulic Flow Limitations – If there are additional features using hydraulic fluid on the machine (example: boom leveling), there may be conditions where the hitch steering valve will require significant amounts of hydraulic fluid (e.g., while turning). During these conditions, there may be limited hydraulic flow to other components, which can result in reduced performance.

Still Having Problems? Contact your local distributor for more information.

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RAVEN

Limited Warranty

What Does this Warranty Cover?

This warranty covers all defects in workmanship or materials in your Raven Applied Technology Division product under normal use, maintenance, and service when used for intended purpose.

How Long is the Coverage Period?

Raven Applied Technology products are covered by this warranty for 12 months from the date of retail sale. In no case will the Limited Warranty period exceed 24 months from the date the product was issued by Raven Industries Applied Technology Division. This warranty coverage applies only to the original owner and is non-transferable.

How Can I Get Service?

Bring the defective part and proof of purchase to your Raven dealer. If the dealer approves the warranty claim, the dealer will process the claim and send it to Raven Industries for final approval. The freight cost to Raven Industries will be the customer's responsibility. The Return Materials Authorization (RMA) number must appear on the box and all documentation (including proof of purchase) must be included inside the box to be sent to Raven Industries.

What Will Raven Industries Do?

Upon confirmation of the warranty claim, Raven Industries will (at our discretion) repair or replace the defective product and pay for the standard return freight, regardless of the inbound shipping method. Expedited freight is available at the customer's expense.

What is not Covered by this Warranty?

Raven Industries will not assume any expense or liability for repairs made outside our facilities without written consent. Raven Industries is not responsible for damage to any associated equipment or products and will not be liable for loss of profit, labor, or other damages. The obligation of this warranty is in lieu of all other warranties, expressed or implied, and no person or organization is authorized to assume any liability for Raven Industries.

Damages caused by normal wear and tear, misuse, abuse, neglect, accident, or improper installation and maintenance are not covered by this warranty.

016-0171-537 Rev. A, E19889

RAVEN

Extended Warranty

What Does this Warranty Cover?

This warranty covers all defects in workmanship or materials in your Raven Applied Technology Division product under normal use, maintenance, and service when used for intended purpose.

Do I Need to Register My Product to Qualify for the Extended Warranty?

Yes. Products/systems must be registered within 30 days of retail sale to receive coverage under the Extended Warranty. If the component does not have a serial tag, the kit it came in must be registered instead.

Where Can I Register My Product for the Extended Warranty?

To register, go online to www.ravenhelp.com and select Product Registration.

How Long is the Extended Warranty Coverage Period?

Raven Applied Technology products that have been registered online are covered for an additional 12 months beyond the Limited Warranty for a total coverage period of 24 months from the date of retail sale. In no case will the Extended Warranty period exceed 36 months from the date the product was issued by Raven Industries Applied Technology Division. This Extended Warranty coverage applies only to the original owner and is non-transferable.

How Can I Get Service?

Bring the defective part and proof of purchase to your Raven dealer. If the dealer approves the warranty claim, the dealer will process the claim and send it to Raven Industries for final approval. The freight cost to Raven Industries will be the customer's responsibility. The Return Materials Authorization (RMA) number must appear on the box and all documentation (including proof of purchase) must be included inside the box to be sent to Raven Industries. In addition, the words "Extended Warranty" must appear on the box and all documentation if the failure is between 12 and 24 months from the retail sale.

What Will Raven Industries Do?

Upon confirmation of the product's registration for the Extended Warranty and the claim itself, Raven Industries will (at our discretion) repair or replace the defective product and pay for the standard return freight, regardless of the inbound shipping method. Expedited freight is available at the customer's expense.

What is Not Covered by the Extended Warranty?

Raven Industries will not assume any expense or liability for repairs made outside our facilities without written consent. Raven Industries is not responsible for damage to any associated equipment or products and will not be liable for loss of profit, labor, or other damages. Cables, hoses, software enhancements, and remanufactured items are not covered by this Extended Warranty. The obligation of this warranty is in lieu of all other warranties, expressed or implied, and no person or organization is authorized to assume any liability for Raven Industries.

Damages caused by normal wear and tear, misuse, abuse, neglect, accident, or improper installation and maintenance are not covered by this warranty.